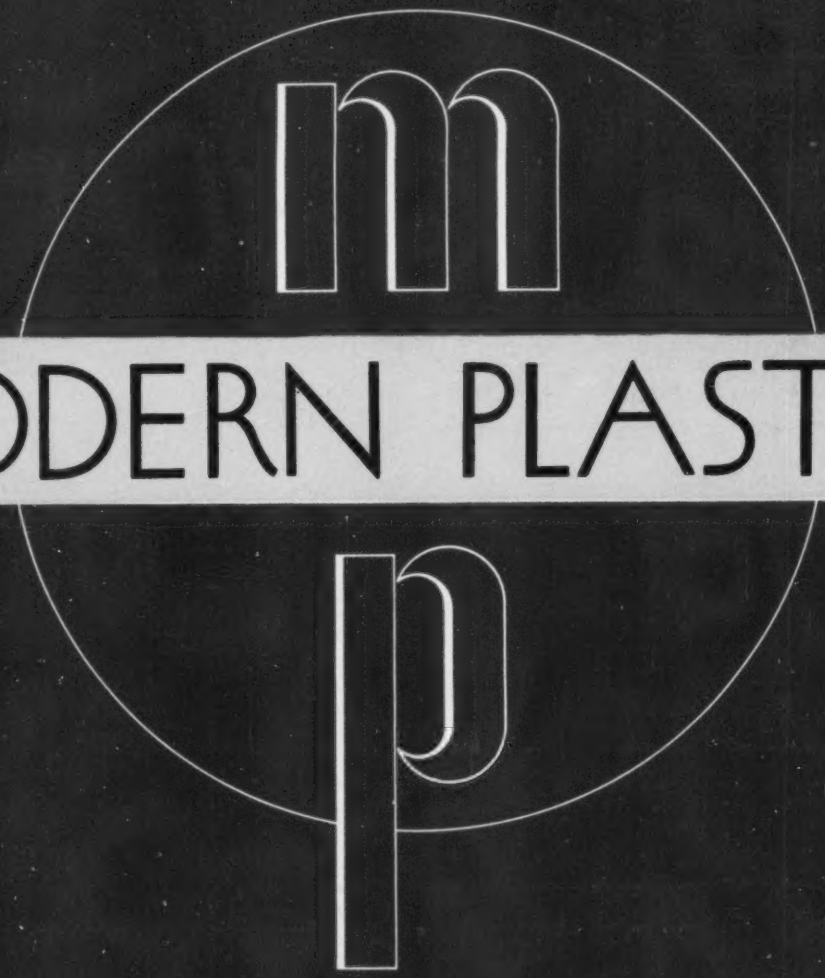

MODERN PLASTICS

FEBRUARY 1954

NEW USES for Reinforced Plastics
.....From HATS to HOUSINGS

Now...a new and STRONGER MOLDING MATERIAL

...highest ever in high-impact phenolic!

Durez now offers you a phenolic plastic molding material having an impact or shock strength in foot-pounds per inch (Izod) ranging up to 27.

This compares favorably with some metals. It is several times as great as the impact strength of molding compounds in general use, the highest impact commercially practical in phenolics to date.

Fiberglas*, the strengthening agent, is used in a manner that conserves the industrially valuable properties of Durez molding phenolics.

Known as Durez 16221, the new material invites consideration for a large variety of applications. It has excellent dimensional stability, a high modulus of elasticity, good electrical properties and resistance to water, heat, and chemicals. It will withstand far higher service temperatures than cellulose-filled materials.

Fiberglas*-filled Durez 16221 is natural in color, comes in dry form, and is readily molded by standard compression methods. It produces parts or components having dependably uniform characteristics.

As specialists in phenolics for 32 years, we offer you the counsel of our field technical staff in investigating the profitable application of Durez 16221, which is now in commercial use.

*Owens-Corning Fiberglas

Want More Facts and Figures?

Send for folder DUREZ "16221 Natural"

DUREZ PLASTICS & CHEMICALS, INC.
1202 Walck Road, North Tonawanda, New York

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
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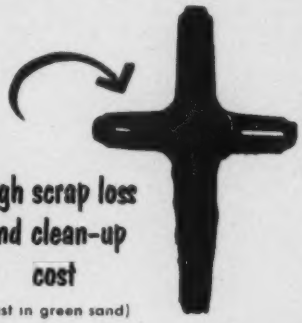

High scrap loss and clean-up cost
(cast in green sand)

Shell molding success with MAGNESIUM

Clean-up down, no scrap loss
(cast in shell molds)

Here's another field where Durez phenolic resins are playing a part in industrial progress. Using shell molds of sand and resin instead of the familiar green sand method, foundrymen now turn out smoother, more accurate castings in a variety of metals. Perhaps *your* business is facing a problem that resins can help in solving. As specialists in phenolics, Durez is ready to work with you.

count on DUREZ for PHENOLIC RESINS too

A *pound* of molded **CATALIN** *Styrene* produces a *ton* of fun!

These popular, educational, Hassenfeld* play sets parlay their pound of lightweight CATALIN STYRENE into loads of fun-providing combinations.

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So complete a showing of assembled value, originality and fun seems deserving of this moral... "When you want to get and give the most for the least — mold and market with CATALIN STYRENE, the gem of plastics".

**Products illustrated are molded and marketed by Hassenfeld Bros., Inc., Pawtucket, R. I.*

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CATALIN

In addition to Styrene Molding Compounds, Catalin chemical products include a wide range of Urea, Phenolic, Cresylic, Resorcinol, Melamine and Styrene Resin formulations.

MODERN PLASTICS*

February 1954 • Vol. 31, No. 6

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Modern Plastics, published monthly by Breskin Publications, Inc., at Emmett St., Bristol, Conn. Executive and Editorial Office: 575 Madison Ave., New York 22, N. Y. Entered as second class matter at the Post Office at Bristol, Conn., December 14, 1950, under the Act of March 3, 1879.
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Modern Plastics is regularly indexed in Industrial Arts Index and Industex. Subscription rates: U.S., its possessions, and Canada, $6.00 for one year, $11.00 for two years, $15.00 for three years; Pan-American countries, $8.00 for one year, $13.00 for two years, $17.00 for three years; all other countries $12.00 for one year, $20.00 for two years, $28.00 for three years, payable in U.S. currency. Single copies of this issue 75 cents each in the U.S., its possessions, and Canada; all other countries $1.25. Printed in the U.S.A. by Hildreth Press, Inc., Bristol, Conn.

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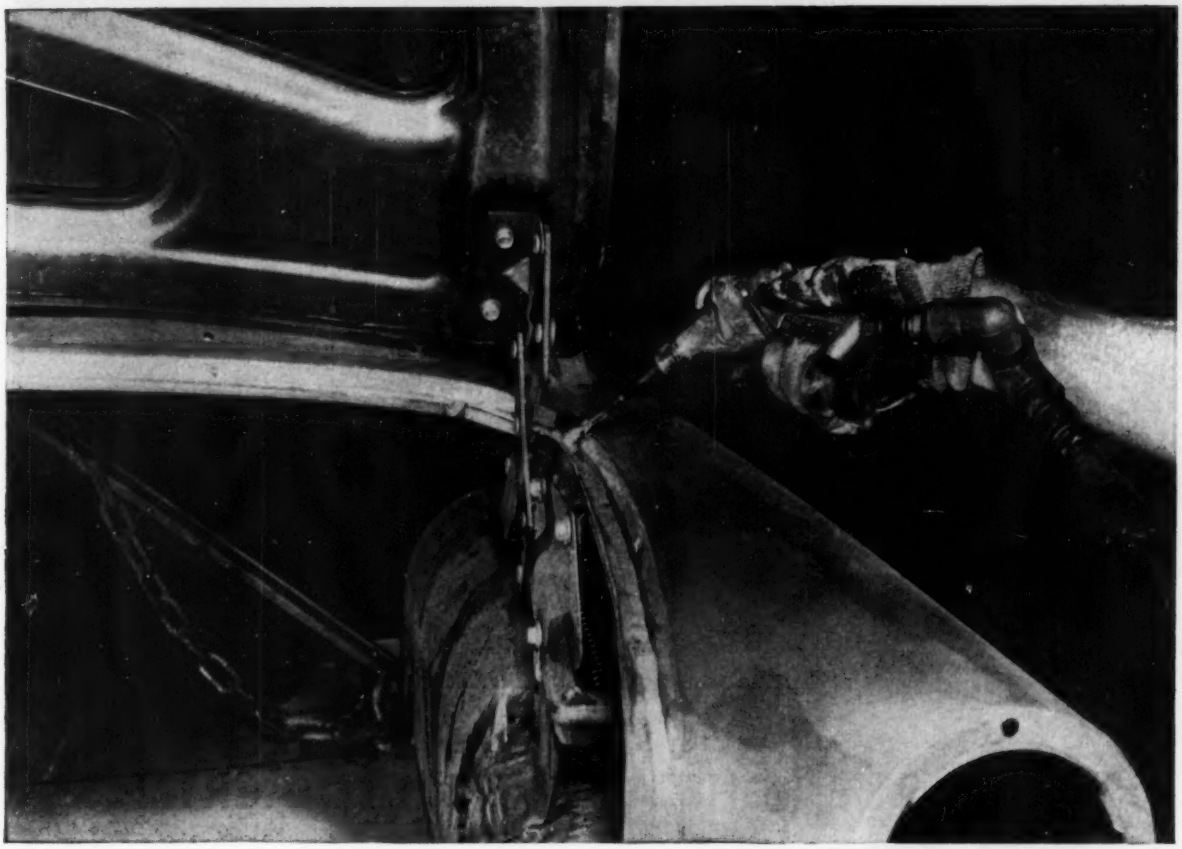

B. F. Goodrich Chemical Company does not manufacture this plastic sealant. We make the Geon paste resin only.

WEATHER-PROOFED FOR THE LIFE OF THE CAR—with Geon!

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This use for Geon paste resin may point out ways to help you improve or develop more saleable products. It can be used in many coating, casting, molding or dipping operations—resists oil, greases and many chemicals. Upholstery, floor mats, trunk linings and electrical parts are only a few products made from Geon. For technical information, please write Dept. GB-2, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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Methyl methacrylate has many other advantages, too. It is not affected by fruit juices. And its smooth surfaces make it easy to clean. Molded in one piece, there are no seams or corners to catch and hold dangerous germs. Hence it's ultra sanitary.

Plenty of molders will tell you that methyl methacrylate is difficult to mold in large units. And it is difficult by conventional methods . . . but here at Chicago Molded we have developed special techniques, skills and equipment that make the job comparatively simple . . . and consistently successful.

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EDITORIAL

Progress Through Mistakes

The Reinforced Plastics Industry continues to expand at a rate of between 40 and 50% per year, a pattern which has held true since 1950. Based only on the use of polyester resins, here is the picture of growth in the industry: 1945—4,000,000 lb.; 1946—400,000 lb.; 1947—1,000,000 lb.; 1948—2,000,000 lb.; 1949—7,000,000 lb.; 1950—9,000,000 lb.; 1951—14,000,000 lb.; 1952—18,000,000 lb.; and 1953—26,000,000 pounds.

And everybody is quite happy about this growth, except the resin makers, the reinforcement manufacturers, and the molders and laminators.

The reason for their unhappiness in the face of such healthy growth is that the obvious markets for reinforced plastics are so fantastic in size. Very conservative surveys made during the past few months indicate that the industry has markets right now which could use at least a hundred million pounds of polyester resins in 1954. But nobody in the industry expects half that amount to be used this year.

Why?

There are many reasons. One is that these are structural materials, and acceptance of new structural materials is necessarily slow because lengthy testing periods are required, because sound engineering data must be built, and because tradition must constantly be bucked. Another reason is that for mass production of structural materials fast methods must be used. Still another reason is that the industry is yet in the stage of its growth when it must make mistakes in order to develop.

More has been accomplished during the past year than most people realize. The first plastics automobile body factory has been built and is now operating. Corrugated glazing is reported to have almost doubled its market. Trays and tote boxes, tanks and tubs have become more widely accepted. Pipe, after a period of bad luck, is again showing marked progress. Housing and industrial components are well established in principle. Boats, of course, are being made in ever increasing numbers.

But it's in the "sleepers" that some of our best prospects exist. Highway signs should get to be big business this year. Reinforced plastics tooling for the working of sheet metals is showing new advances almost daily. Building components other than glazing may be expected to receive the benefits of reinforced plastics this year. Out of the sports car development may well come applications to light trucks, station wagons, and farm equipment. Recent interest on the part of industrial seating manufacturers may be resultful.

The cry at all levels of the industry that we need this and that type of new resin, this and that new mechanical engineering development, this and that new approach to marketing, is utterly sincere. All these things we need—and will get.

Meanwhile, many more mistakes will be made because many more things will be tried. And out of these mistakes will come new procedures and new products.

The reinforced plastics industry need never fear for its future, need never be saddened by the fact that it has not caught up with its apparent markets, as long as the men in it are prepared to make more mistakes.

only a few inches more floor space than the smallest grinder

but *MORE THAN TRIPLE THE PRODUCTION CAPACITY*

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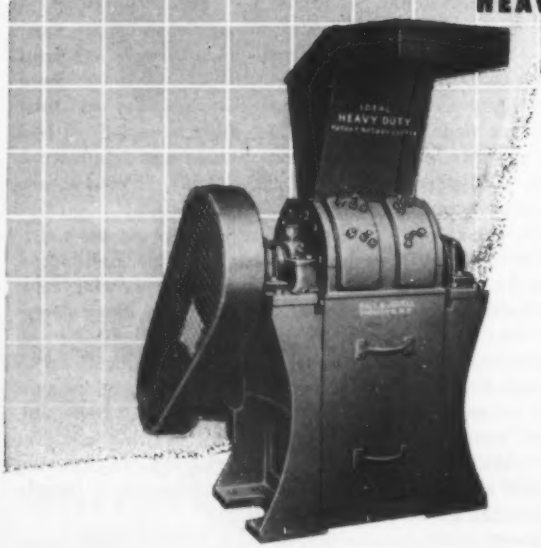
STANDARD IDEAL *FOR BESIDE-THE-PRESS and ACCUMULATED SCRAP*

If you're a big injection molding plant, you'll use the B & J Standard Ideal for beside-the-press grinding and get up to 250 pounds an hour. Smaller shops use it for accumulated scrap. Large plant or small, you'll appreciate the compact size of the machine—only 27" x 36" of floor space. You'll like its rugged strength — built for long, trouble-free performance — as well as the powerful 2 or 3 H.P. motor and the quick, easy way it is cleaned. Your choice of 3½"x10" or 6"x10" throat opening, fits the Standard Ideal to your requirements for grinding medium area rejects as well as sprues and runners. Satisfied shops all over the world agree, "It's the finest small size machine available."



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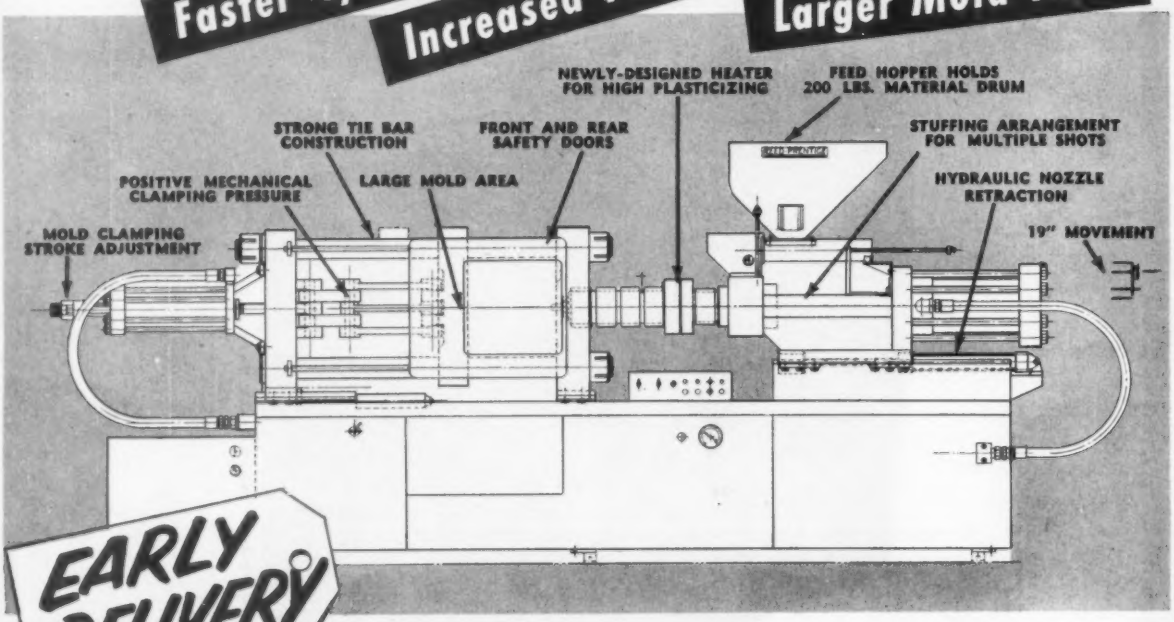
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OUTSIDE

INSIDE

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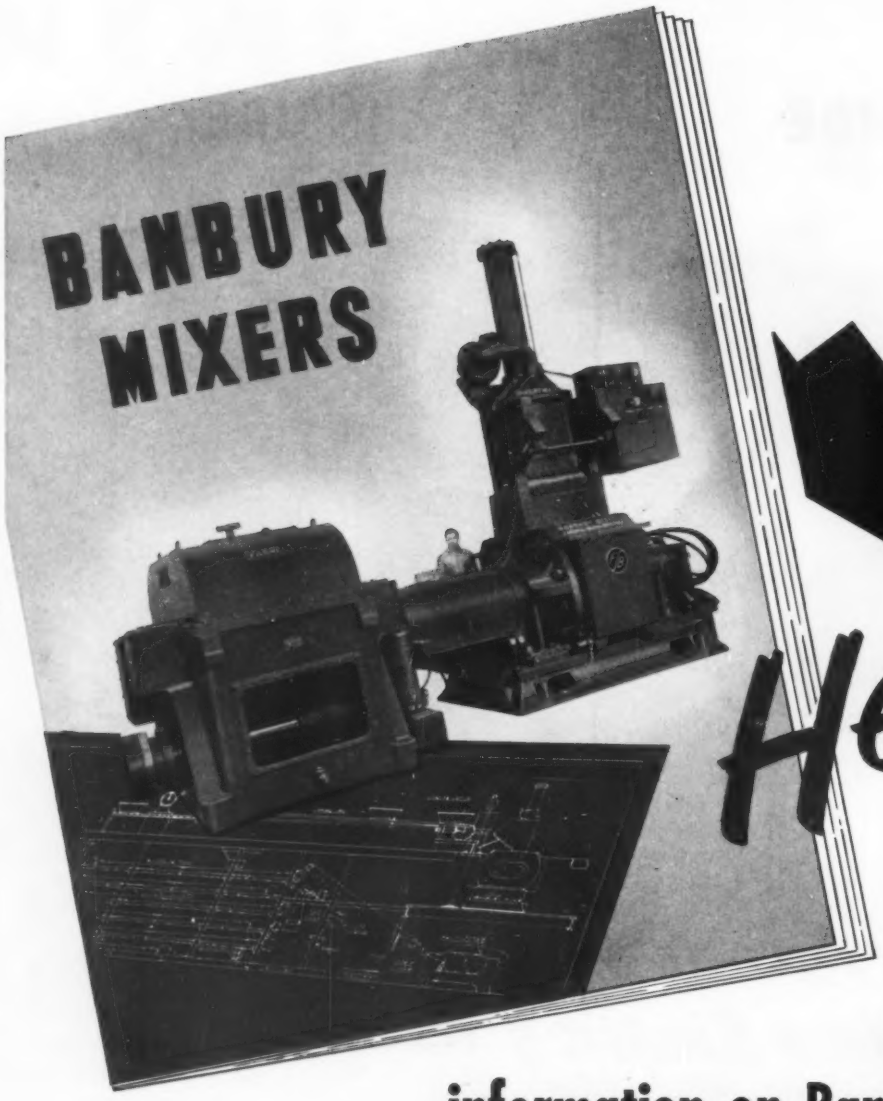

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is the latest information on Banbury* mixers

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ANSONIA, CONNECTICUT

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Company.....

Address.....

City.....State.....

This new, 32-page, illustrated bulletin gives data on recent design advancements in Banbury mixers, including the heavy-duty, "Uni-drive" machine which has been developed for high-pressure, short-cycle mixing.

Photographs of the different sizes and types of Banburys, and various applications with pertinent drawings are included, as well as information and illustrations covering related equipment such as, mills, calenders, extruders, etc.

A revised table listing the sizes and capacities of the complete line of Banbury mixers has also been included.

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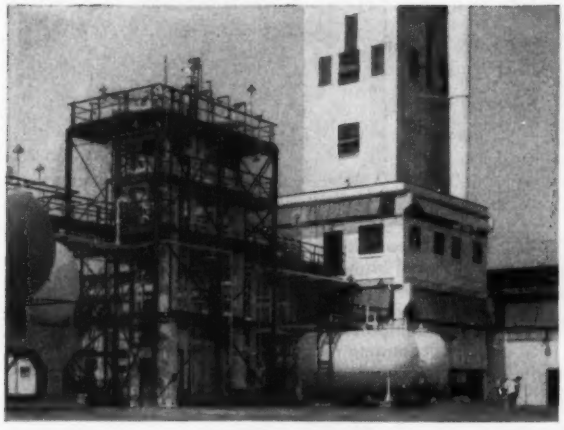

From 500 feet down this plant draws cool, clear well water, pure enough to drink. But it's further purified, deionized and deaerated before it's used to process DIAMOND PVC. *One of the many safeguards to assure uniform high quality.*

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For information on DIAMOND PVC and the cooperation of our technical staff, write DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

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for example—

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for example—

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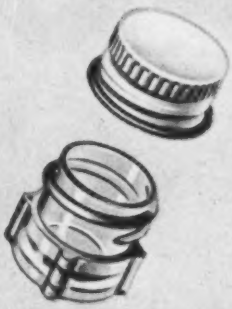

for example—

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for example—

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Owens-Illinois packaging know-how and high-quality standards offer you the *finest* in molding plastic facilities . . . Injection molding . . . Compression molding . . . A complete range in plastics for packaging, for specialties.

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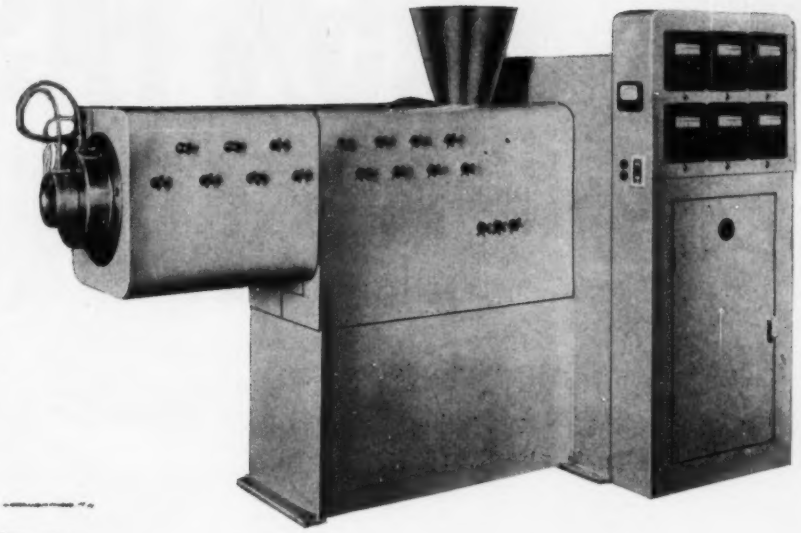
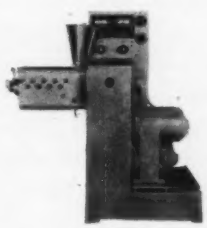
PRECISION PLASTICS
AN (O) PRODUCT

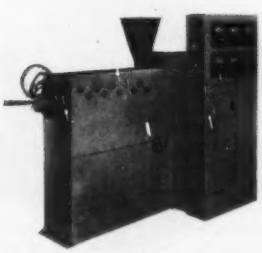
OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO



DEPENDABLE PERFORMERS...ALL!



Materials extruded include nylon, Kel-F, polystyrene, acetate, methacrylate, polyethylene, polyvinyl chloride and Formvar.



MPM extruders, in all sizes, are in daily use in more than eighteen countries, outside of the United States.

When the "show must go on" MPM extruders can be depended upon to maintain close tolerances, high output and uninterrupted production, week after week, month after month, year after year.

The experience of countless extruders all over the world tells the story: MPM extruders are known to have the built-in endurance that insures production that is both continuous and profitable.

MPM extruders, in all sizes, have screws, strainers, cylinders, die heads, hoppers, and other vital parts which are made of corrosion resistant materials through and through.

And MPM extruders won't be outdated by the introduction of new plastic materials. Some models have as many as fifteen cooling zones . . . all have internally heated or cooled screws. Proof of their versatility can be found in the fact that nearly all material manufacturers use MPM's for laboratory development work.

Indications are that the demand for extruded products will grow for many years to come. Owners of MPM extruders and auxiliary equipment will be in the best position to meet this demand. Ask today for full data about an MPM extruder that will be your most dependable performer.

West Coast Representative
4113 West Jefferson St.
Los Angeles 16, Calif.

modern plastic machinery corp. mpm

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

25% FASTER CALENDERING

of heavy vinyl sheeting with PLIOVIC

So reads the report on Textileather Corporation, manufacturers of Tolex a new "plastic leathercloth" especially designed for use in coats, jackets and sportswear—and of other high quality, fabric-backed, heavy-gauge vinyl sheeting.

Using PLIOVIC – Goodyear's easier processing polyvinyl chloride resin – Textileather found they could operate their calenders at speeds up to 25% higher than those possible with any other resin tried. And they had no problem with the streaking, roughening or loss of gloss usually encountered in the finished sheet at such speeds.

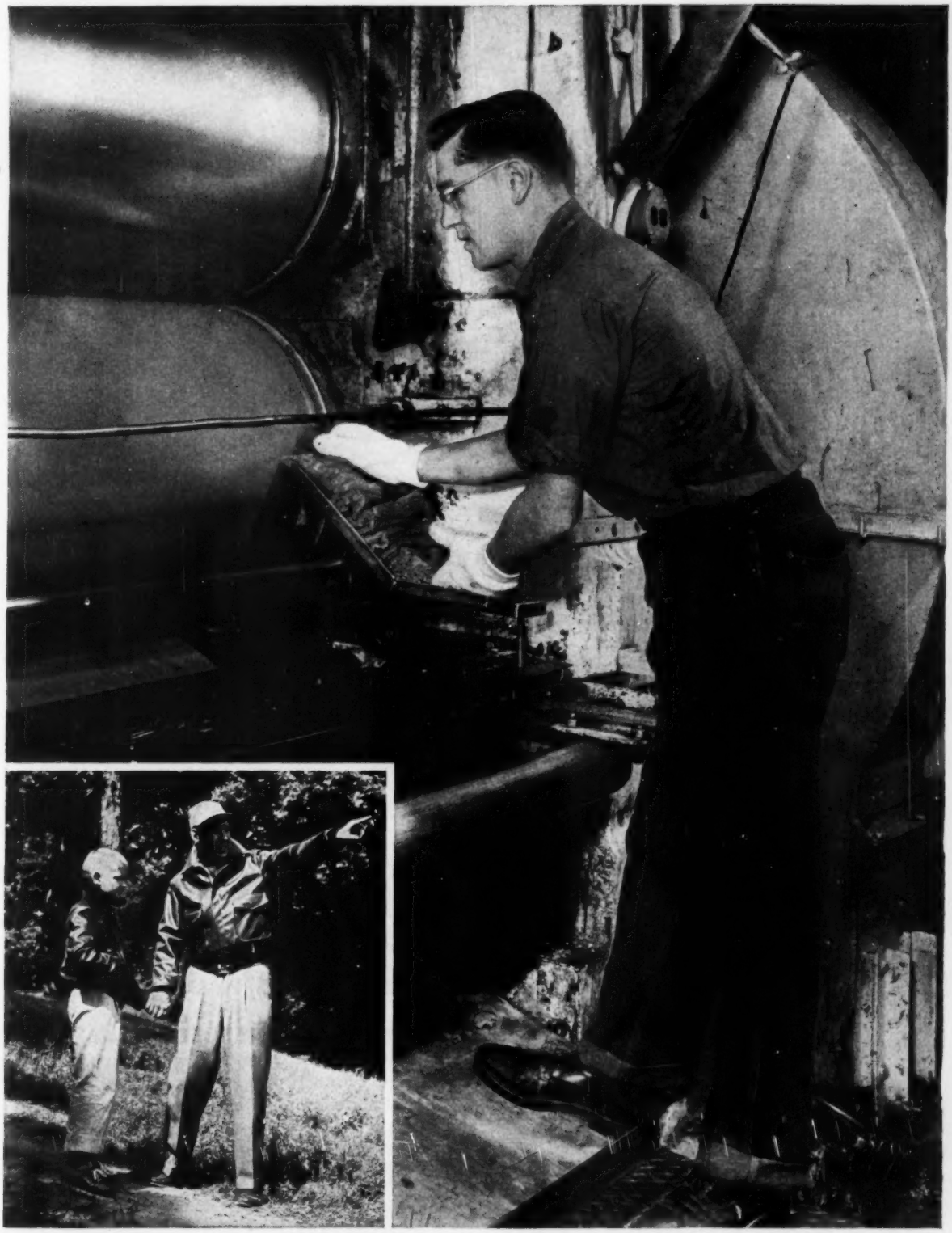
Two other advantages gained with PLIOVIC were the elimination of "fish-eyes"—hard agglomerates of unfused particles—in the sheet and the use of larger batches in the Banbury. All these added up to more throughput at lower cost, but at the same high level of quality.

Reason for this improved production with PLIOVIC is the fact that its polymerization is carefully controlled to give a particle size, shape and distribution, providing high bulk density and fast fluxing, combined with maximum physical properties.

PLIOVIC has proved itself in many plants. It can in yours. Just give it the chance. Get samples, the new technical manual and complete help, by writing to: Goodyear, Chemical Division, Akron 16, Ohio.

CHEMICAL GOODYEAR DIVISION

Use-Proved Products—CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS—The Finest Chemicals for Industry



TOLEX MAKES these jackets soft, pliable, waterproof and highly resistant to scuffing or abrasion. PLIOVIC permits this fabric-reinforced sheeting to be calendered faster and at lower cost.

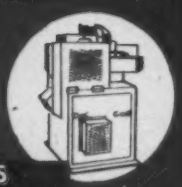
Tolex T. M. Textileather Corporation, Toledo, Ohio

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

In Plastics Reducing Machinery, Look to CUMBERLAND for the COMPLETE LINE

GRANULATORS



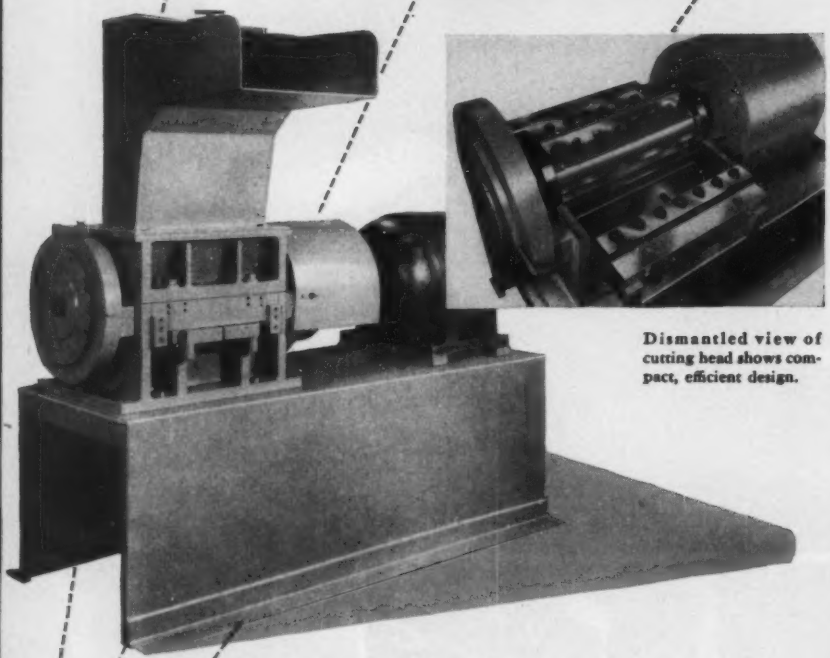
DICERS

CHOPPERS

PREBREAKERS

MODEL 20 All Steel Granulator

CUSTOM ENGINEERED QUALITY BUILT



Dismantled view of cutting head shows compact, efficient design.

1 HEAVY DUTY — Large flywheel—thick all-steel weldments—deep welds—parts are of flawless wrought steel (not steel castings)—machine resists wreckage.

2 LARGE THROAT OPENING — 8 by 20" size.

3 PRIOR BANDSAWING NOT NEEDED — Machine specially built to handle large chunky parts such as bleeder scrap, cylinder purgings and heavy cast slabs of polystyrene, modified polystyrene and acrylic resins.

CUMBERLAND *Engineering Company Inc.*

BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY

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Write for complete details

RESISTS almost EVERYTHING

KEL-F* properties

- Chemically Inert to All Acids, All Alkalis, Solvents
- Excellent Compressive Strength . . . 32,000 to 80,000 psi.
- High Dielectric Properties
- Zero Water Absorption
- Wide Temperature Utility—from −320° F. to +390° F.
- Dimensionally Stable—unaffected by temperature, moisture, age
- High Impact Strength. Low Cold Flow
- Non-wetting

*Trade Name of M. W. Kellogg Co.

KEL-F* Parts Compression-Transfer-Moulded by K-K Of Special Interest to the Chemical, Electrical and Food Processing Industries

Check the partial list of KEL-F properties. Determine for yourself where and how these characteristics can improve your product or procedures. If the application is highly specialized, then the Kurz-Kasch method of compression-transfer moulding *might* be your logical answer.

As examples of the benefits you can expect, the chemical pump parts and integrally-moulded valve liners pictured above will, through their chemical inertness alone, give infinitely more satisfactory service and freedom from expensive maintenance and replacement. Also, note a large electrical insulator moulded around a complex insert.

These are the kinds of fluorocarbon applications we specialize in—those parts that can best be compression-transfer moulded. Send us your inquiries on KEL-F—on Teflon—on moulded glass-filled polyesters—or any thermo-setting materials. We're equipped and ready for compression, transfer and plunger moulding exclusively—and anxious to work into your plans for the earliest feasible moment. Just write or call.

KURZ-KASCH

Specialists in Thermo-Setting Plastics for 37 years

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BRANCH SALES OFFICES: New York, Lexington 2-6677 • Rochester, Hillside 4352 • Chicago, Merrimac 7-1830 • Detroit, Trinity 3-7050 • Philadelphia, Hilltop 6-6472 • Dallas, Logan 5234 • Los Angeles, Richmond 7-5381 • St. Louis, Delmar 9577 • Toronto, Riverdale 3511
EXPORT OFFICE: 89 Broad St., New York City, Bowling Green 9-7751.

Plant Manager Ed Campi Reports:

"... best preform press on the market for high production of large pills."

THE INTERNATIONAL MOLDED PLASTICS PROBLEM:

To maintain the high quality of their dinnerware, International Molded Plastics, Inc., depends upon obtaining very accurate weight, density and dimensions in preforming melamine formaldehyde.

THE BALDWIN SOLUTION:

Edward Campi, Plant Manager of International Molded Plastics, Inc., Cleveland, explains how three Baldwin Model #20 Preform Presses have solved their threefold problem:

1. **"Inaccurate weight pills are costly because flash and rejects are a total loss. By holding preform weight as accurate as possible with production speeds that are necessary, our Baldwin press has reduced rejects greatly.**

2. **"Melamine formaldehyde requires eight to ten tons p.s.i. to give preforms of satisfactory hardness. Only the Baldwin-Defiance press meets these specifications to our satisfaction.**

3. **"We can prewarm electronically several preforms uniformly at one time because the Baldwin-Defiance machine makes preforms of uniform thickness."**

Mr. Campi reports a further benefit: "Not only can we make a die change in fifteen to twenty minutes, but also the Baldwin press is constructed without exposed gears or other working parts which would make it difficult to clean . . . a major problem in manufacturing pastel and dark shades of dinnerware."

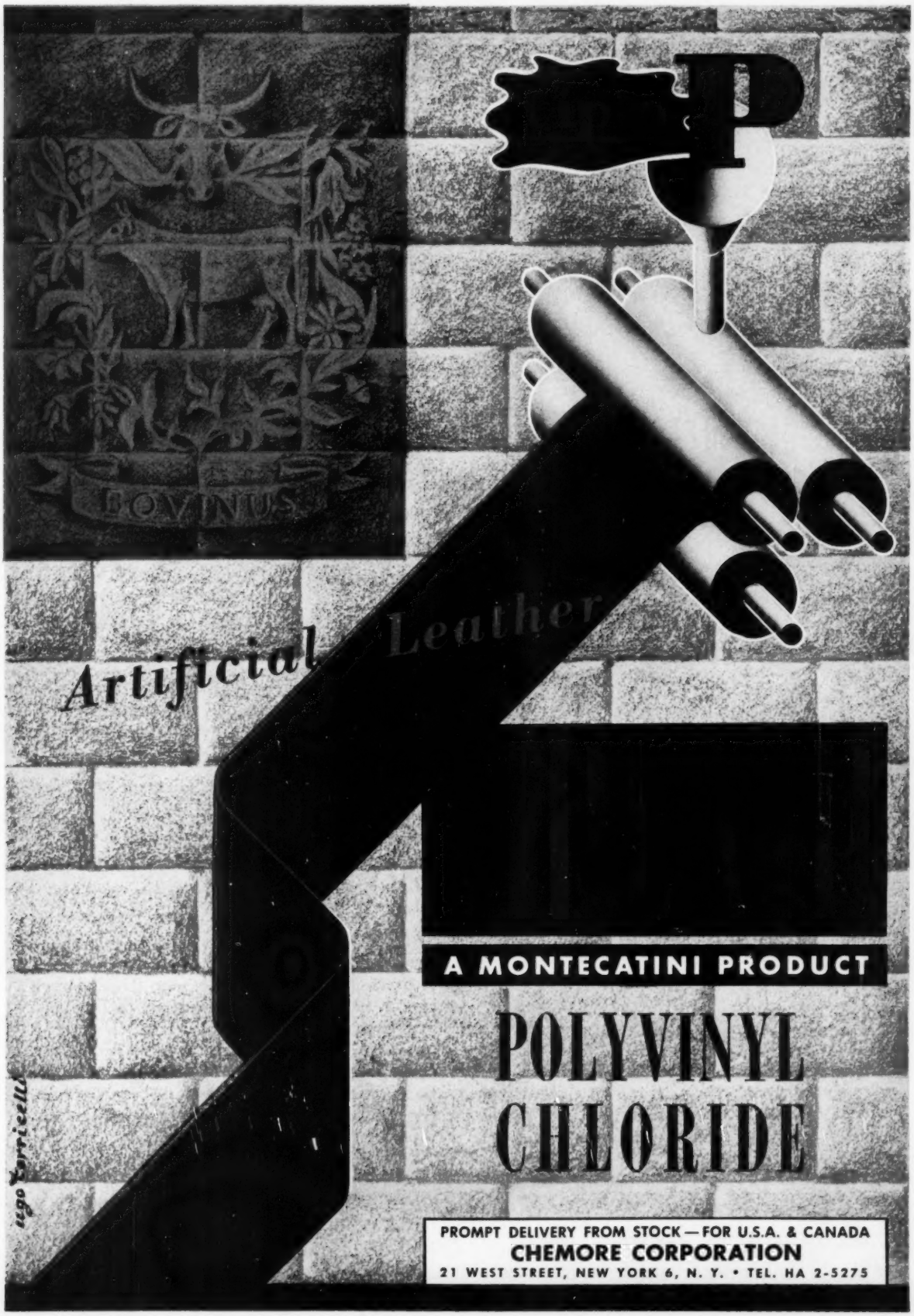
WHAT'S YOUR PRESSING PROBLEM?

For help in solving any of your compacting problems, write for Bulletin 323 to Dept. 4326, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

BALDWIN BLH LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. • Offices in Principal Cities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Artificial Leather
A MONTECATINI PRODUCT
POLYVINYL CHLORIDE
PROMPT DELIVERY FROM STOCK — FOR U.S.A. & CANADA
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Today's growing use of fiber glass reinforcements in plastics molding brings up problems on every new molding job.

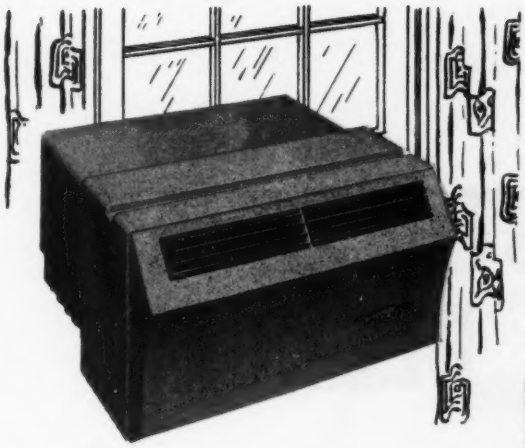
That's why it's extremely wise to call in your local Pittsburgh Fiber Glass representative for his recommendations on the type and size of fiber glass you should use on any particular molding job. While you know your molding problems best, he and the technical staff at Pittsburgh can contribute technical information on the fiber glass reinforcement that will best suit your individual molding job.

There's over 70 years of glass-making "know-how" behind PPG Fiber Glass and its manufacture. This know-how has meant new high quality in Roving, Chopped Strands and Yarns bearing the Pittsburgh label. Why not get the complete details on Pittsburgh Fiber Glass reinforcements and technical service today? Simply contact our executive offices or district sales offices in Chicago, Cincinnati, Cleveland, Detroit, New York or Washington. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.

Write our executive offices today for the new folder describing Pittsburgh Fiber Glass reinforcements.

FIBER PPG GLASS **PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS**

PITTSBURGH PLATE GLASS COMPANY



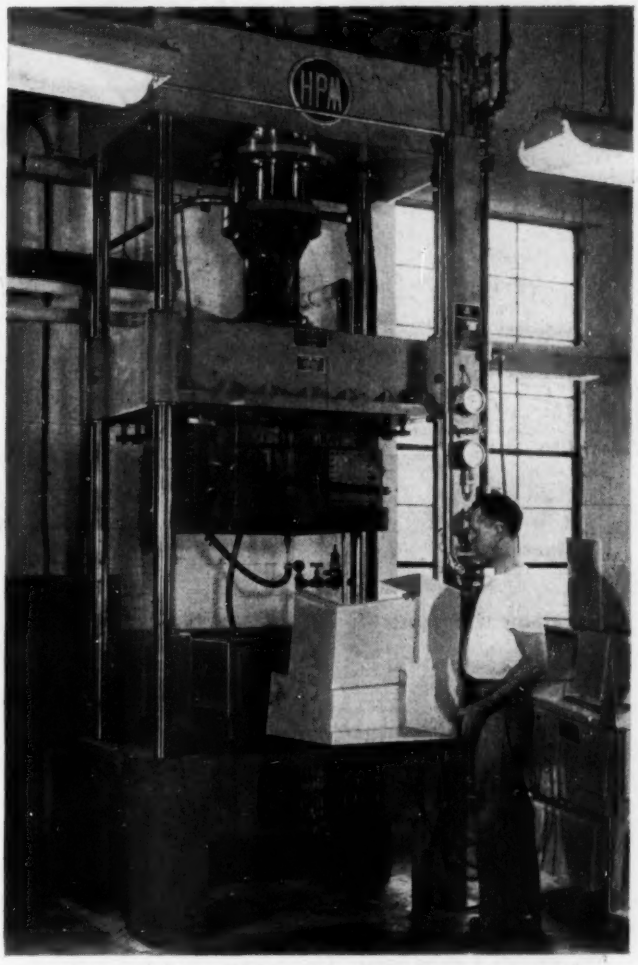
H-P-M STOCK PRESSES SOLVE TOUGH MOLDING JOB FOR STRUCTURLITE!

AIR CONDITIONING

. . . A NEW FIELD FOR REINFORCED PLASTICS!

● H-P-M was ready with a complete line of stock presses when the room air conditioning boom hit . . . and Structurlite Corporation took advantage of it. They secured contracts, ordered 100-ton H-P-M presses and are really in business.

H-P-M builds a complete line of stock presses, each with enough daylight and stroke for every job . . . from flat parts to washing machine tubs (see the tough part in the illustration). Each press is equipped with the accurate automatic controls so necessary in the molding of reinforced plastics. Talk to an H-P-M engineer, today, about stock presses for this booming industry!



This 100-ton H-P-M is producing housings for the United States Air Conditioning Corporation room air conditioning units shown above. Cabinet measures 16¾" x 26½" x 25½", weighs 8 lbs. and is a polyester-fibre-glass material.

HPM

THE HYDRAULIC PRESS MFG. COMPANY

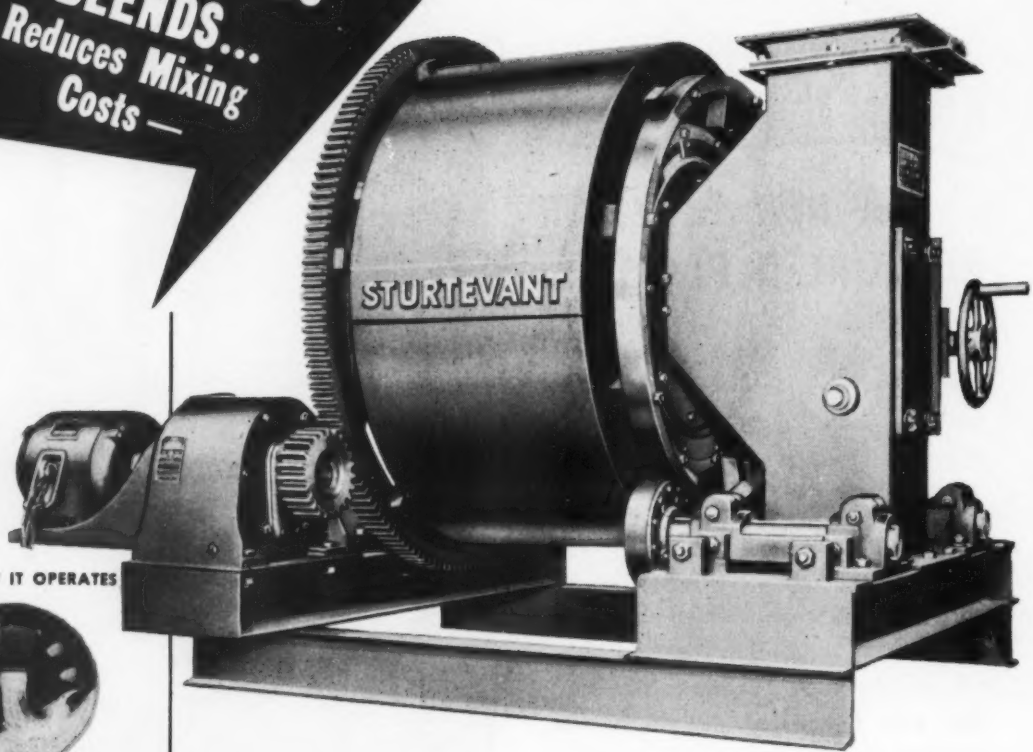
1010 MARION ROAD, MOUNT GILEAD, OHIO

Presses for Every Pressure Processing Need!

4 WAY MIXING ACTION PRODUCES HOMOGENEOUS BLENDS... Reduces Mixing Costs —

with the

STURTEVANT BLENDER



HERE'S HOW IT OPERATES

RECEIVING

As the materials are received, they are picked up by scoops and cascaded from the top of the machine. At the same time, the revolving drum forces the materials from both ends toward the center of the drum . . . while the swinging chute, which is in mixing position, produces a fourth lateral mixing action.

DISCHARGING

By simply throwing a lever, the inlet is closed and the blender is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients.

Four separate mixing actions in the Sturtevant Blender assure complete blending of various materials regardless of weights, densities, finenesses, or other physical properties.

This mixing action provides a thoroughly blended product with no substances floating to remain unmixed.

Sturtevant Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.

STURTEVANT MILL COMPANY

110 CLAYTON STREET, BOSTON 22, MASSACHUSETTS

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

The Frog and the Ox

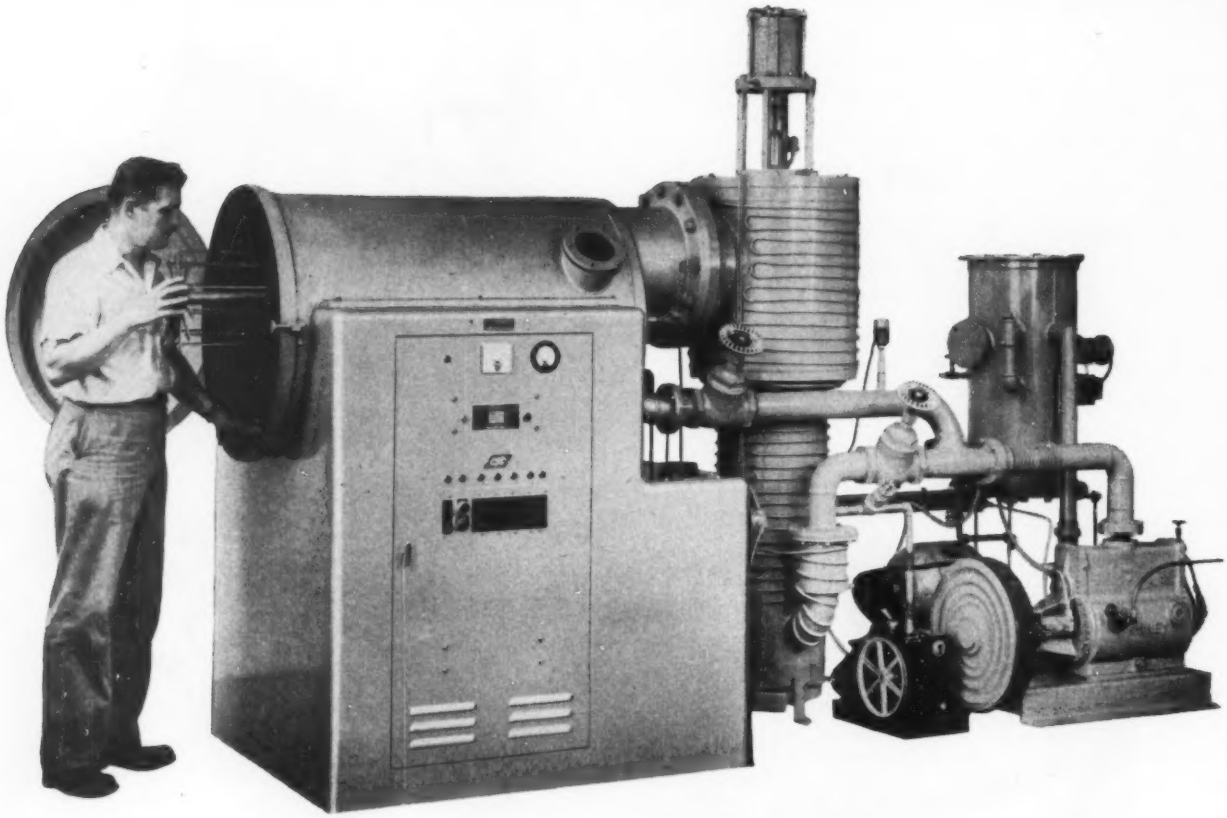
An Ox grazing in a meadow, chanced to set his foot among a group of young Frogs, and crushed almost the whole brood to death. One that escaped ran off to his mother with the dreadful news. "And, oh mother!" said he, "it was a beast—such a big beast!—that did it." "Big?" quoth the old Frog, "how big? Was it as big"—and she puffed herself—"as big as this?" "Oh!" said the little one, "a great deal bigger than that." "Well, was it so big?" and she swelled herself out more. "Indeed, mother, it was; and if you were to burst yourself, you would never reach half its size." Provoked, the old Frog made one more trial, and burst herself. — *Aesop*

PLENCO PHENOLICS

FOR BETTER PLASTIC PRODUCTS

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin

At Plenco, our engineers always view your particular problem in the proper perspective.



Just right for the small or medium sized finisher...

CVC's new 30-inch high vacuum metallizer

This new *CVC* high vacuum coater, Model LC1-30, was specifically designed to meet the demands for a moderate sized high vacuum metallizing unit.

You don't need to be a high vacuum engineer to set up and operate this new *CVC* coater. It comes complete with all necessary controls—need only be connected to service lines. Here are the details:

- Compact and easy to operate, all cycle switches and valves accessible from one point.
- Simple and inexpensive fixtures are available for either front or second surface coating.
- Two 35-inch long-work holding fixtures will each accommodate over 200 pieces of plastic or metal 1½" in diameter.
- The short cycle time—4 to 5 cycles per hour—gets the work out in a hurry.

If you've been looking for a high vacuum coater that's neither too big nor too small, *CVC*'s Model LC1-30 is your answer. For complete details, write to ***Consolidated Vacuum Corporation, Rochester 3, N. Y.*** (a subsidiary of Consolidated Engineering Corporation, Pasadena, California).

CVC

Consolidated Vacuum Corporation

Rochester 3, N. Y.

formerly DPi Vacuum Equipment Dept.

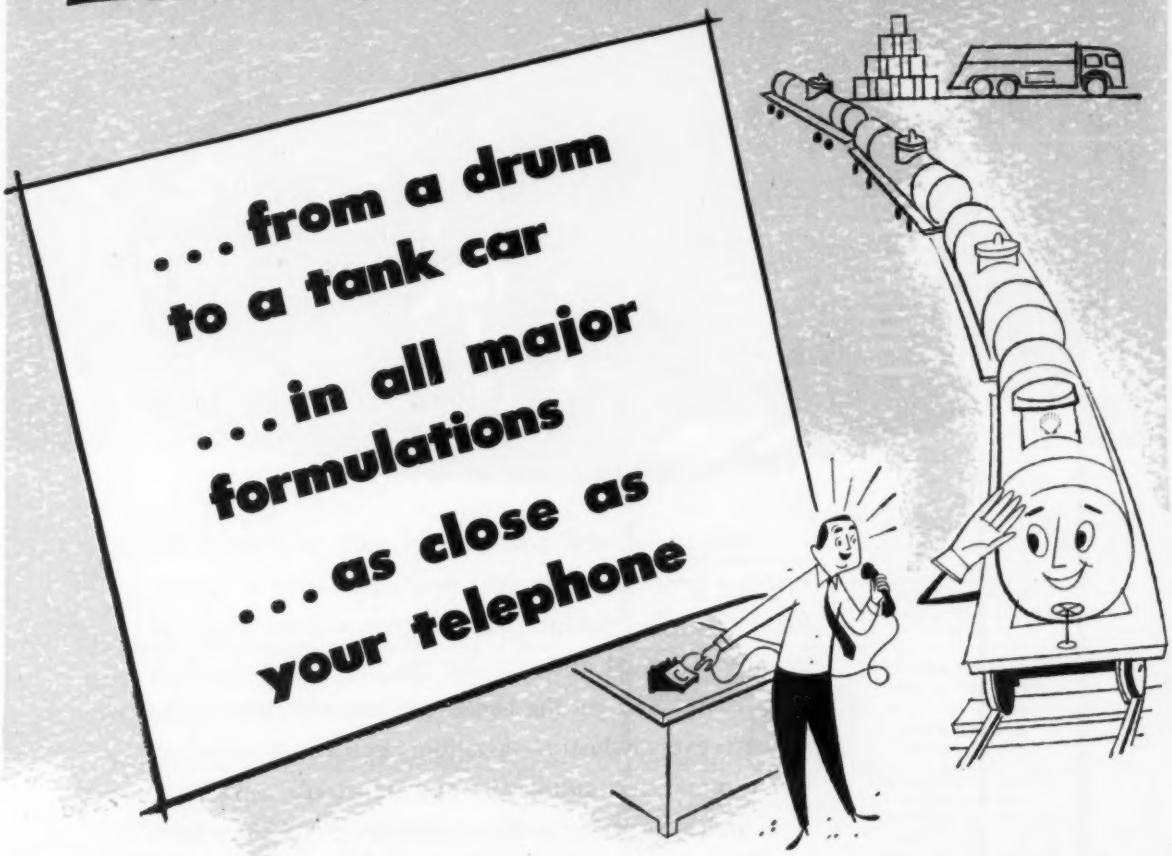
designers and manufacturers of high vacuum equipment

SALES OFFICES: PALO ALTO, CALIF. • CHICAGO, ILL. • CAMDEN, N. J. • NEW YORK, N. Y.

NOW!

SHELL CHEMICAL

ETHYL ALCOHOL



As THE NEED for dependable petroleum-derived ethyl alcohol has become more and more urgent, Shell Chemical has expanded its distribution facilities.

Now, complete denaturing plants have been established in three key industrial centers, ready to make the fastest possible delivery to you in any quantity you may need . . . in drums, tank trucks, compartment trucks, tank cars or compartment tank cars.*

Shell Chemical's ethyl alcohol is of the highest quality, meeting or surpassing all Federal and commercial specifications for purity. It is available as pure alcohol (190 proof), in specially and completely denatured grades, and as the two proprietary solvents, Neosol® and Neosol A.

Your Shell Chemical representative will be glad to discuss your alcohol supply problem with you, at your convenience. You are invited to telephone or write.

*Tank truck and drum availability west of Rocky Mountains is limited.

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CHEMICAL PARTNER OF INDUSTRY AND AGRICULTURE

Eastern Division: 500 Fifth Avenue, New York 36 • Western Division: 100 Bush Street, San Francisco 6
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Don't wait until your plastics parts production becomes a problem—turn that production over to Quinn-Berry now. Our facilities are complete—from design to making the mold and running the part in our modern press room. You get the benefits of our wide experience in nearly every industry—aviation, electrical, housewares, business machine, automotive and industrial.

Make use of Quinn-Berry experience and know-how. You will find it profitable to turn your plastics parts production over to us.

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PLASTICS

MOLDERS OF ALL TYPES OF THERMOPLASTIC MATERIALS

Why the VINYL FLOORING INDUSTRY turns to "Dutch Boy" Normasal Vinyl Stabilizer to improve its product

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Di-basic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols
	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light-stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears

Asbestos filler is important in the making of high grade vinyl flooring. To use it satisfactorily, the industry has turned to "Dutch Boy" Normasal.

Normasal, flooring makers have found, is the *only* stabilizer that prevents the color changes in vinyl formulations that asbestos impurities sometimes produce.

More often than not, Normasal is "teamed up" with Tribase, a "Dutch Boy" stabilizer that provides the high heat stability needed in processing vinyls.

For more information about Normasal, Tribase, or any of the other "Dutch Boy" Stabilizers, write us. We will be glad to give you additional data and technical information.

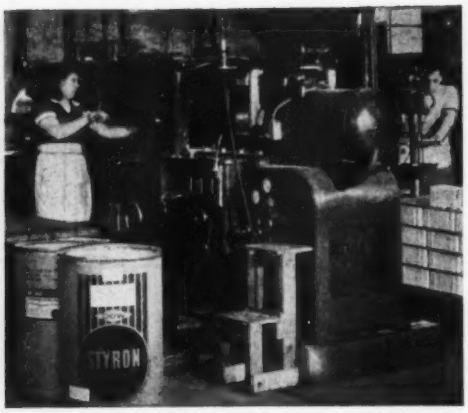
NATIONAL LEAD COMPANY
111 Broadway • New York 6, N. Y.

Dutch Boy®

*Reg. U. S. Pat. Off. **CHEMICALS** *

In Canada:
CANADIAN TITANIUM PIGMENTS LIMITED
630 Dorchester Street, West • Montreal

Mold Making Here is a section of our tool room where skilled tool makers, working closely with our designers and engineers, turn out intricate molds designed and built for long, trouble-free production runs. Experienced engineers and designers are at your service to work with your engineering staff or to handle the entire job for you.



Injection Molding Injection equipment permits an unlimited choice of both color and material. Our presses, equipped with the most modern control devices, mold polystyrene, acetate, butyrate, polyethylene and nylon in a wide range of sizes.

A *Complete* Source for Quality Plastic Moldings

FROM start to finish, Mallory Plastics' facilities and services are complete, designed to handle your job economically and to your most exacting requirements. Designing, material selection, tooling and production are integrated as a complete service. Modern equipment includes facilities for compression molding, transfer molding, injection molding, hot stamping, glass-reinforced plastic molding, spray decoration and assembly.

If your product, or any of its components, can be produced in plastics, write or call us for complete details. Regardless of design requirements, we can do the job to your specifications . . . with delivery to meet your schedules.

P. R. MALLORY PLASTICS, INC.
3670 MILWAUKEE AVE. • CHICAGO 41, ILLINOIS

A subsidiary of P.R. MALLORY & CO. Inc. MALLORY

Compression and Transfer Molding The most complicated plastic parts, requiring exacting tolerances, can be molded by our modern equipment. Presses ranging from 75 tons to 750 tons capacity, provide facilities for producing parts of all sizes. Proper material storage and conditioning, electronic pre-heating and special control devices insure high production and prompt delivery.

Finishing Skilled personnel in our finishing department are your assurance of parts ready for the production line. Flash removal, filing, sanding, polishing, painting, assembling and packing provide you with a complete plastics service.

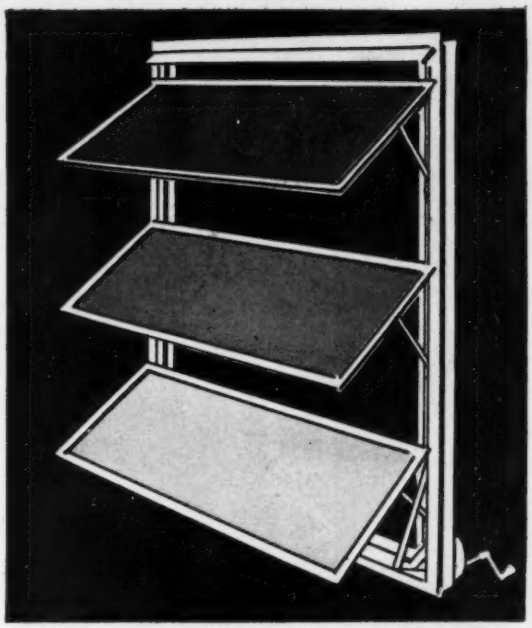
The Greatest Advance in Glazing History

GRADATION *TROPIGLAS*★

permits you to select the amount of light you desire

GRADATION TROPIGLAS is the new and safe glazing material for industrial, commercial and residential use. Made of reinforced fiber glass, it possesses all of the strength, dimensional stability and impact resistance inherent in such material.

Of far greater importance is the system of GRADATION which we have incorporated in TROPIGLAS to eliminate harsh rays of light that penetrate ordinary glass . . .to bring soft, pleasant light to any interior in the degree that you desire . . . to spread the light over a larger area thereby putting it to greater use.

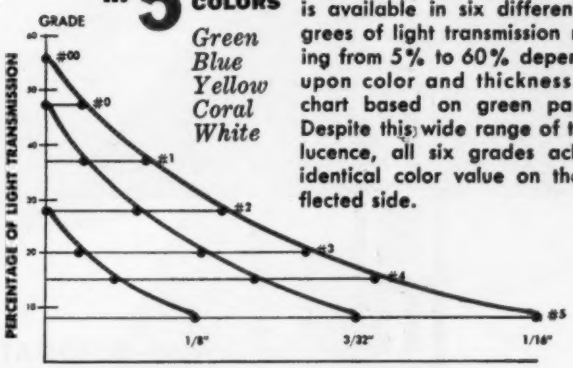


for factories, offices, stores, schools, hospitals, public buildings and homes

No other glazing material can offer the advantages of GRADATION TROPIGAS in new buildings or as replacement for regular window panes in modernized structures. In addition, it is being used extensively for hurricane and storm windows, translucent coverings for patios and breezeways, windbreaks, illuminated signs, decorative partitions and for many other functional applications.

in 5 COLORS

Green
Blue
Yellow
Coral
White



Each of the five attractive colors is available in six different degrees of light transmission ranging from 5% to 60% depending upon color and thickness (see chart based on green panels). Despite this wide range of translucence, all six grades achieve identical color value on the reflected side.

The best features of ALL these products are combined in GRADATION *TROPIGLAS*

This new product is a combination of all these mechanical devices. Installed in awning-type windows for example, GRADATION TROPIGLAS serves as an awning when open, a venetian blind open or closed, a glare deflector by inbuilt characteristic and a shade at all times. IMAGINE . . . one product serves all these purposes.

Write us today on your letterhead. We will send you samples, descriptive folder and prices.

Russell **REINFORCED PLASTICS CORP.**

Manufacturers of *Repco Plastics*

WEST HOFFMAN AVENUE, LINDENHURST, L. I., N. Y.

Lindenhurst 5-1700

*T. M. Reg.

"Formvac" Standard Model AA, twin-table design. Molding area 24 x 36" per platen, with up to 14" depth of draw. Models having other dimensions are under development.

FORMVAC

FORMVAC

Patents Pending

"Formvac" is a registered trade-mark of Hydro-Chemie Ltd.

NEW AUTOMATIC VACUUM DEEP DRAWING AND FORMING MACHINE molds both rigid and flexible sheet thermoplastics

The new "Formvac" revolutionizes the economics and product quality of vacuum forming. Fully mechanized, foolproof operation slashes costs of large or small articles deep-drawn from either rigid or flexible thermoplastic sheet. Swiss precision engineering and robust construction assure perfect product quality and no maintenance problems.

- **Automatic, foolproof operation**
- **Extremely fast cycles**
- **Attractively priced**
- **Early delivery**

For descriptive folder please write manufacturers:

Plastics Development Division

HYDRO-CHEMIE LIMITED
"Claridenhof", Dreikönigstrasse 21
ZURICH — SWITZERLAND

ZENITH skill produces world's largest radomes for Lockheed "Sentinels of the Air"

The huge radomes above and below the Lockheed Super-Constellation, and the novel anti-icing radome in the nose, are products of Zenith's specialized technique and skill in reinforced plastics combined with electronics. These are the giant radomes which provide 360-degree "eyes and ears" for the U. S. Navy and Air Force, scouting far beyond the borders of the United States for early warning of enemy attack.

Zenith's unique background of experience in this highly specialized field is available on contact with Engineering Department—

HOTTER'N A SHERIFF'S PISTOL!

The Lewis "6" Injection Molding Machine

. . . is changing all established concepts of economy, speed and safety of operation among plastics molders. This revolutionary new machine will plasticize 60 pounds of polystyrene per hour and can mold large projected area parts weighing more than 7 ounces at the rate of 2½ per minute. Injection pressures up to 15,000 psi . . . compensating feed mechanism . . . automatic molding cycle . . . large platens . . . finger-tip controls . . . fast opening die-lock mechanism and minimum maintenance make the LEWIS "6" outstanding for low-cost high-speed production molding. Intricate parts formerly made on much larger machines now can be produced on Model "6" at a fraction of initial and normal operating costs. The LEWIS "6" also features the exclusive new "Hydra-Lock" clamp . . . the safest, most powerful mold clamping device available today. "Hydra-Lock" develops a 200-ton clamping pressure in tenths of a second . . . facilitates quicker, easier mold setting procedures.

Hotter'n a sheriff's pistol . . . the LEWIS "6" is your best buy in injection molding machines!

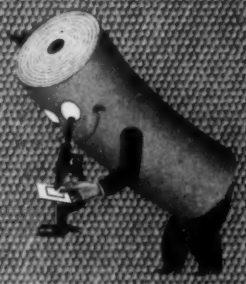
Write for BULLETIN 102 for details and specifications.

1729-LW

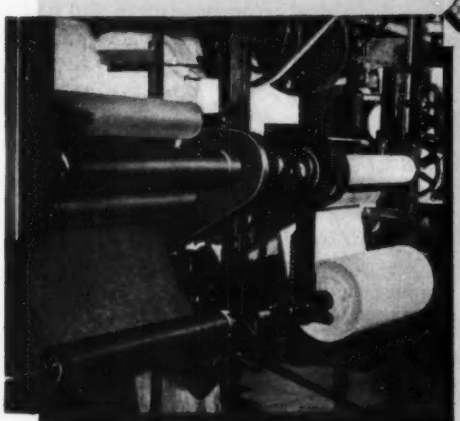
THE LEWIS WELDING LEWIS & ENGINEERING CORPORATION

11 Interstate Street
Bedford, Ohio

UNIFORMITY
Makes The Big Difference In LAMINATION FABRICS



MT. VERNON EXTRA
GIVES YOU GREATER FABRIC UNIFORMITY



One of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products. Here fabric thickness after weaving is being gauged.

FABRICS ENGINEERED TO FIT YOUR NEEDS

Need adaptation of an existing fabric to your special purposes? Or creation of an entirely NEW fabric — cotton, synthetic or blend — to meet your specifications? Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

Mt. Vernon-Woodberry Mills

Branch Offices: Chicago • Atlanta
Baltimore • Boston • Los Angeles

TURNER HALSEY COMPANY
Selling Agents
40 WORTH ST NEW YORK

ELMES HYDRAULIC PRESSES

are setting records in

Big-Profit Plastics Molding

COMPRESSION and TRANSFER MOLDING PRESSES

In full range of sizes for fast work. Convenient pushbutton panel; pushbutton pneumatic reset of lower knockout; automatic position slow-down; extra large die space; many other features.

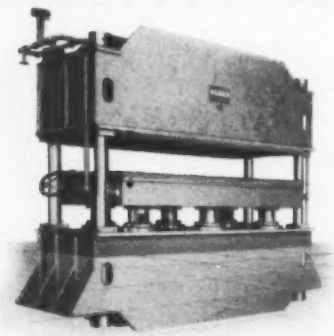
In scores of plastics molding plants, ELMES Presses are proving daily *by performance* that there is no real substitute for the ELMES Engineering Staff's century-long hydraulics background and problem-solving ingenuity in modern press design.

Invariably, when an ELMES Press goes into operation, the customer gets exactly what our engineers have *planned* for him:

Top speed, accurate production.
Full push-button controls: for step-by-step or automatic-time-cycle operation.
Simplified design, for low-cost minimum maintenance.
Better work . . . longer runs . . . bigger profits!

Your plastics molding needs may be such that the ideal press to meet them has already been planned, and is now available as one of the ELMES *standard designs*. Or you may have *special* requirements, which our staff will meet with either a modification of one of our standard designs—or an entirely new "custom-built" press.

In any case, however simple or complex your particular "pressing problem," it will pay you to secure the experienced advice and counsel of Elmes engineers. Individual recommendations and cost estimates will be supplied to you promptly on request—and entirely without obligation.



CUSTOM-BUILT PRESS — FOR LOW-PRESSURE POLYESTER RESINS

450-ton Hot Plate Press—6 single-acting cylinders set into press bed, unrestrained. Rams bear against finished pads beneath moving platen. Completely pushbutton controlled.

HYDROLAIRS®
Powered by Shop Air Line!

The answer to low-cost, high quality output for *every* plastics molder. No motors, no pumps. Easy to install. Capable. Quiet. Compact. Bench and floor models. Capacities to 50 tons. All accessories.

WRITE FOR BULLETIN 5200-A

Fully illustrated —gives complete information on standard-design Elmes Presses for the plastics industry.

American Steel Foundries

ELMES ENGINEERING DIVISION

METAL WORKING PRESSES • PLASTIC MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

THIS TEEN-AGER IS AN Old Timer

There is a teen-ager in the Interchemical family of whom we are mighty proud. His name, if you please, is Mr. I. C. Polyester and he is making quite a name for himself in an industry that is only just as old as he is.

Born in the early days of World War II, his first job was to seal aircraft engine castings to make them oil-tight in order that our nation might have wings.

Raised in the atmosphere of a fine old Interchemical heritage, with its traditions of quality and service dating back over a hundred years, he has grown in stature and versatility until he is now respected as an old timer in the young reinforced plastics industry.

In his sample case he carries a series of resins designed to cover virtually all types of Polyester applications, a line of color concentrates to provide a rainbow of hues, and a fund of "know how" and technical service that makes him an ever-welcome visitor to those who have come to know him.

Wouldn't YOU like to make his acquaintance?

Interchemical Corporation

Finishes Division

Factories: Chicago, Ill. • Cincinnati, Ohio • Elizabeth, N. J. • Los Angeles, Cal. • Newark, N. J. • Mexico City, Mex.

In Canada, IC products are sold by AULCRAFT PAINTS LTD., Toronto, Ont., under its trademarks.

Beware of speed demons

In its archives, Boonton has a special folder reserved for collecting tales about the poor bruised souls who contracted for custom molding with gents who said they would deliver perfect pieces, faster, lots faster, than the more esteemed members of our august profession.

When one molder promises you to deliver lots faster than several other molders are able to, one of three things will probably happen: (1) The pieces you get ain't worth the price you pay. Or, (2) delivery comes well after the promised date. Or, (3) you don't get any pieces at all.

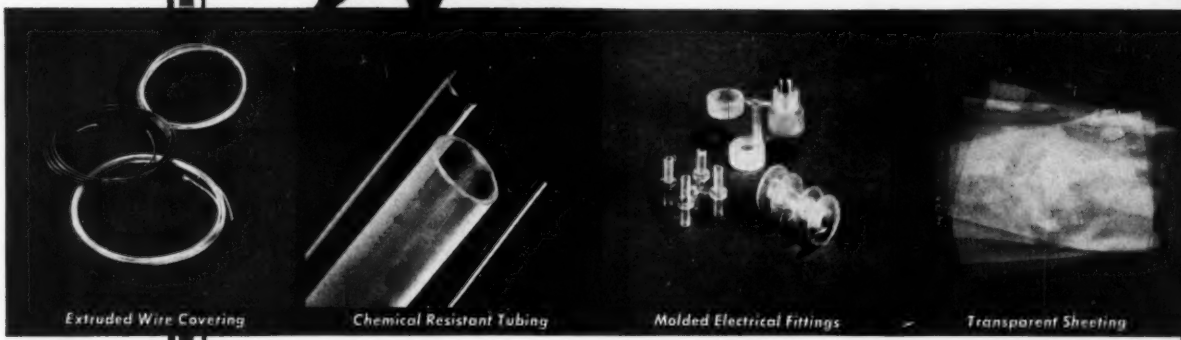
Now Boonton is not the only reliable custom molder. There are quite a few others like us—experienced, trustworthy, capable. We became what we are because we recognize that certain things are impossible, and refuse to promise to do them.

If you need fast service, of course we'll try to help you. But if you need IMPOSSIBLY fast service, our prayers go with you.

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

NEW YORK OFFICE—CHANIN BUILDING, 122 EAST 42ND STREET, OXFORD 7-0155



From MINUS 195 Deg. C. to 220 Deg. C. . .

WIDE WORKING TEMPERATURE RANGE OF BAKELITE FLUOROTHENE *OPENS NEW FIELDS TO PLASTICS INDUSTRY*

Products made from BAKELITE Fluorothenes can be used effectively between minus 195 deg. C. and 220 deg. C. Successful experiments have shown that these materials are practicable for high-temperature wire insulation, valve seats, gaskets, and insulation for printed circuits.

They have excellent chemical resistance. For example, fluorothene is used for containers and piping to carry corrosive chemicals such as fuming nitric acid. An outstanding electrical property, especially at elevated temperatures, is volume resistivity which is so high that it can be measured only by extremely sensitive instruments.

BAKELITE Fluorothenes are rigid thermoplastic polymers—so hard that hammer blows on a solid piece hardly leave a mark. Long periods of submersion reveal no sign of moisture absorption. Tests on various thicknesses of wire insulated with fluorothenes showed that they will not support combustion.

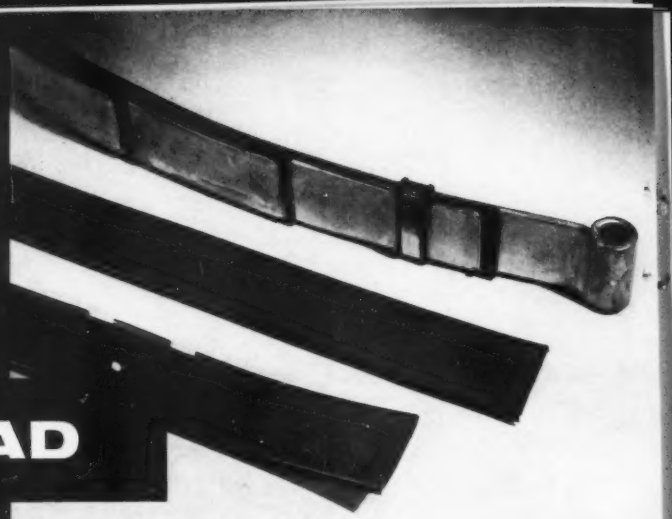
These characteristics are already generating interest among industries connected with chemical processing, electric power, packaging, medical supplies, radio and television. Detailed technical information is available from Bakelite Company in a free booklet describing the forms, properties, and fabrication of BAKELITE Fluorothenes. To get your copy, write Dept. TH-13.

BAKELITE
TRADE-MARK
Fluorothene

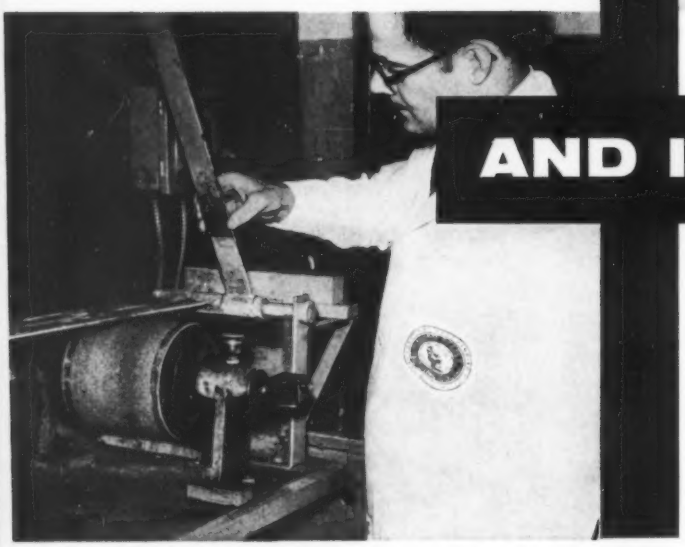
BAKELITE COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, New York

In Canada:
Bakelite Company, a Division of Union Carbide Canada Ltd.
Belleville, Ontario

tested



ON THE ROAD



AND IN THE LAB

Here's double proof of BAKELITE Polyethylene's *wear resistance*

On the Road—BAKELITE Polyethylene proves its outstanding wear resistance when molded into automobile leaf spring liners. These "dry lubricants" fit tightly between the leaves, preventing squeaks caused by metal-to-metal contact. Their waxy surface is unaffected by hot or cold weather. Their molded flanges hold the leaves in line and seal out grit that can cause spring breakdown. These liners won't absorb moisture, and are unaffected by salt and other snow-melting chemicals.

In the Lab—the wear resistance of BAKELITE Polyethylene is shown by tests described in a report by the U. S. Testing Co., dated Sept. 24, 1953. In comparison with a well-known rubber-type compound, BAKELITE Polyethylene was tested by rubbing it against various surfaces with a rotary motion, a reciprocating motion, and a combination of both. The abrading agents were "Aloxite" 320 metal cloth, cold-rolled steel, and maple wood.

Conclusion stated that BAKELITE Polyethylene possessed "superior abrasion resistance." In one test, involving rotary motion, and employing "Aloxite" 320 as the abrading agent, BAKELITE Polyethylene lost 40 to 45 per cent of its thickness in 2000 revolutions, while the rubber-type compound lost 75 to 80 per cent in 280 revolutions.

Such evidence of the toughness and wear resistance inherent in BAKELITE Polyethylene indicates increased use of this material for molding and extrusion applications where service conditions will be severe. Wire covering is an example. Complete details on the abrasion resistance tests are given in KABELITEMS No. 67. For your free copy, write Dept. TJ-13.

BAKELITE
TRADE-MARK
Polyethylene

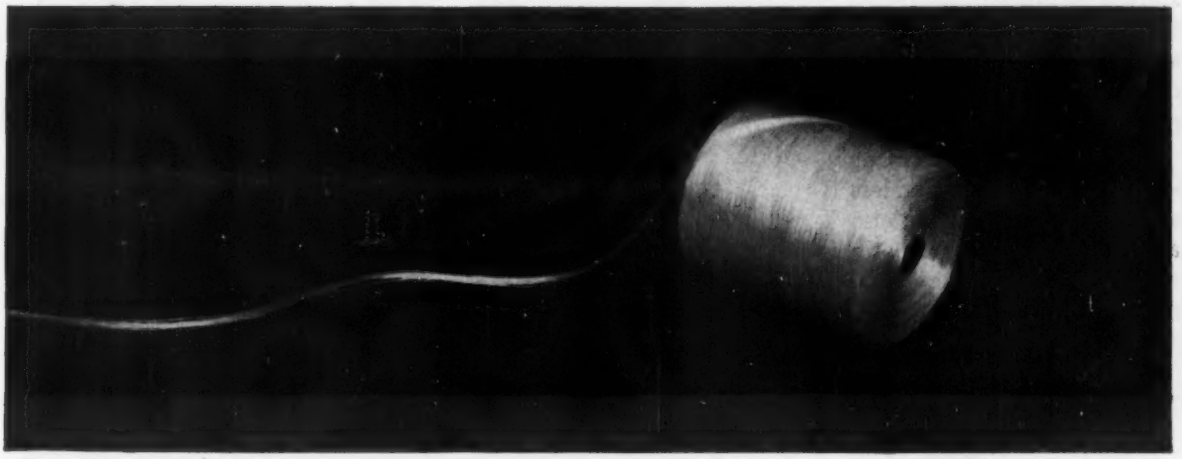
BAKELITE COMPANY

A Division of Union Carbide and Carbon Corporation UCC

30 East 42nd Street, New York 17, New York

In Canada:
Bakelite Company, a Division of Union Carbide Canada Ltd.
Belleville, Ontario

Fiberglas Guarantees roving of plus or minus 5% consistency



Owens-Corning Fiberglas is proud to announce new greater precision control of weight of roving in relation to yardage. Improvements in our production process enable us to narrow our tolerance from ±10% from the average (e.g. 235 yds. per lb. for 60 end roving) to ±5%, an improvement of 100% in product uniformity. Now you can chop roving at constant speed and metered times and get twice as good control as formerly on uniformity of weight of your preforms. This means better quality parts and fewer rejects for the Fiberglas Reinforced Plastics molder. This improvement in our roving goes right through every ball from inside to outside.

OWENS-CORNING FIBERGLAS CORPORATION
Reinforced Plastics Division
16 East 56th Street, New York 22, N. Y.

Leading a great new industry forward—in research and development, marketing and technical facilities, experience, quality control and service.

OWENS-CORNING
FIBERGLAS

DAKE PRESSES

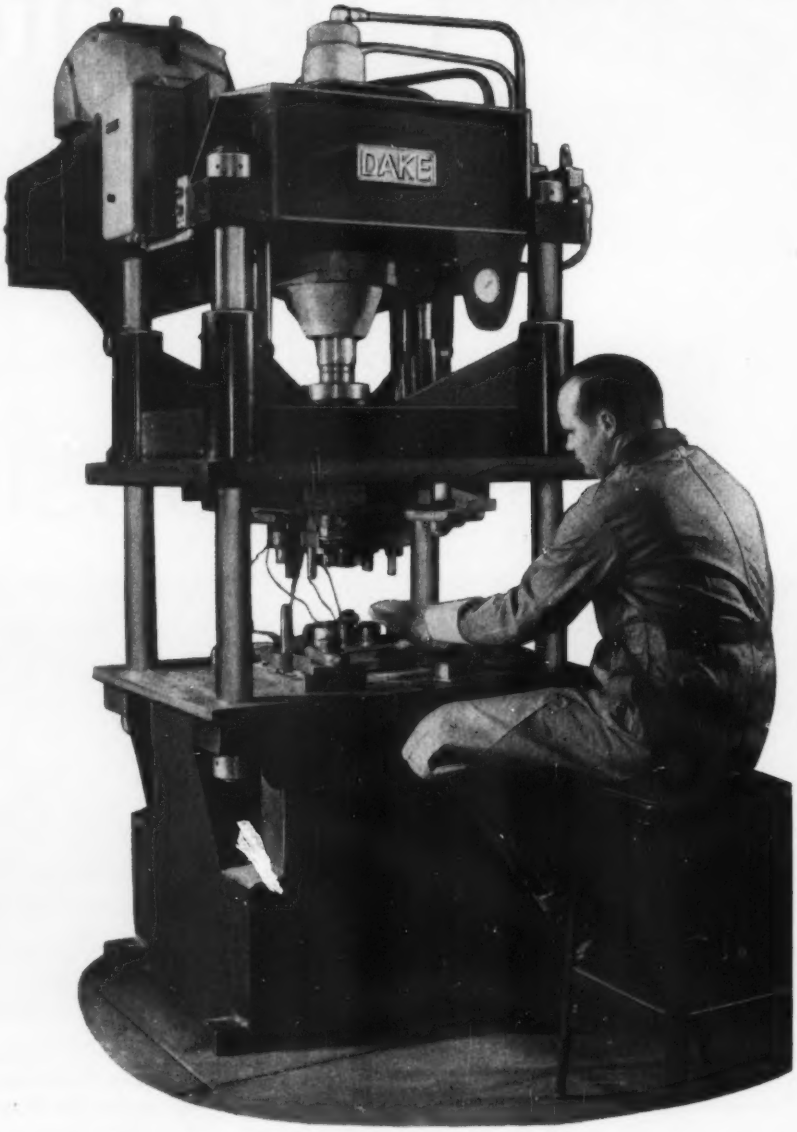
for compression molding reinforced plastics

Dake Plastics Presses are engineered by men experienced in the plastics industry who can help you meet special needs and requirements, as well as provide better equipment for ordinary molding.

Standard models are electric-hydraulic in operation, with capacities ranging from 25 to 300 tons. They are adjustable for stroke, pressure, temperature, and timing of the cure.

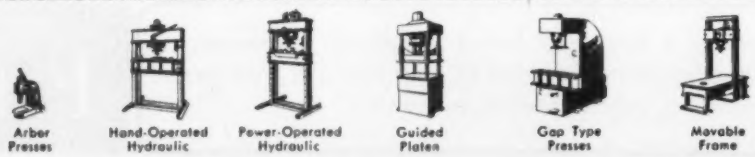
The operation is started by pressing dual palm switches (for safety), and is automatic through the entire curing cycle and return of the platen to starting position.

Other presses with simpler controls and less automatic operation are also available. Send for Bulletin #273, and tell us your special requirements.



Dake Engine Company, 648 Seventh St., Grand Haven, Mich.

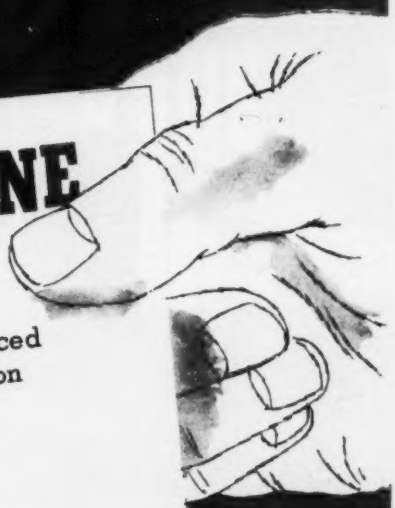
DAKE PRESSES



MUEHLSTEIN

VIRGIN POLYSTYRENE

As exclusive distributors for Fostarene—Muehlstein offers you a dependable source for quality Virgin Polystyrene. Our experienced technicians and nation-wide sales organization stand ready to serve you.



MUEHLSTEIN

REPROCESSED PLASTICS

If you sell plastic scrap . . . use reprocessed plastics or have your scrap reprocessed—look to Muehlstein for reliable service. Our complete laboratory facilities and technical staff assure satisfaction, especially with color problems.

H. MUEHLSTEIN & CO. INC.

60 EAST 42nd STREET, NEW YORK 17, N. Y.

BRANCH OFFICES: Akron · Chicago · Boston · Los Angeles · Memphis
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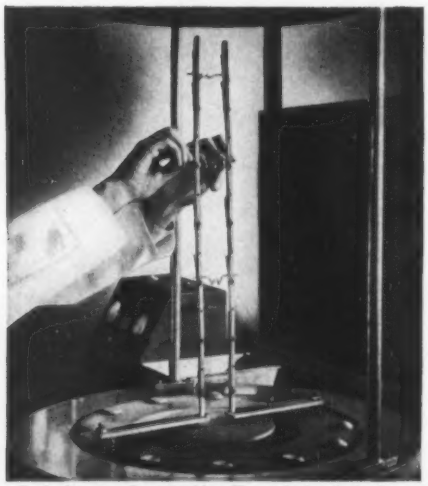
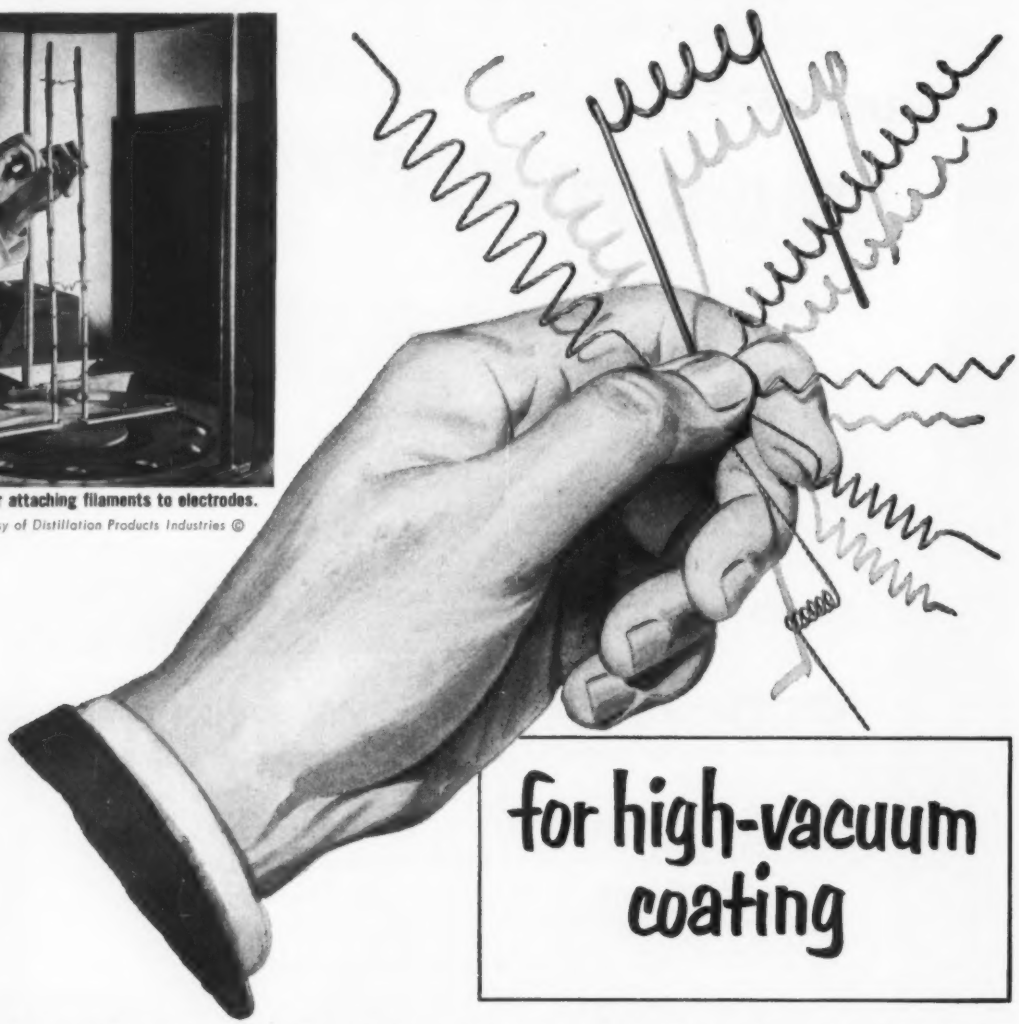
Sylvania Tungsten Coils



Typical means for attaching filaments to electrodes.

Photograph courtesy of Distillation Products Industries ©



for high-vacuum coating

Sylvania custom made tungsten coils assure highest performance at lowest cost

Sylvania either has a tungsten coil or will design one for your particular need. We have the facilities and engineering know-how to supply you with the right coil for any job.

Here's why Sylvania Tungsten Coils save you money:

- You can count on certainty of operation in each cycle.
- They provide a uniform deposit of metal where you want it.
- They reduce mechanical breakage in loading of filaments.
- You get more shots from each filament and best heat for evaporation.

Sylvania offers a complete line of efficient ready made coils. Each of these high grade tungsten filaments is designed for a specific job. Each has the most efficient section and surface area to assure you excellent performance . . . at the lowest cost.

If you make your own tungsten coils, Sylvania can supply you with the highest quality tungsten wire—single or multiple strand, as well as expert design assistance.

For full information write for the free Sylvania Brochure 4T-2402, Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

SYLVANIA

LIGHTING • RADIO • ELECTRONICS • TELEVISION

In Canada: Sylvania Electric (Canada) Ltd.
University Tower Building, St. Catherine Street, Montreal, P. Q.

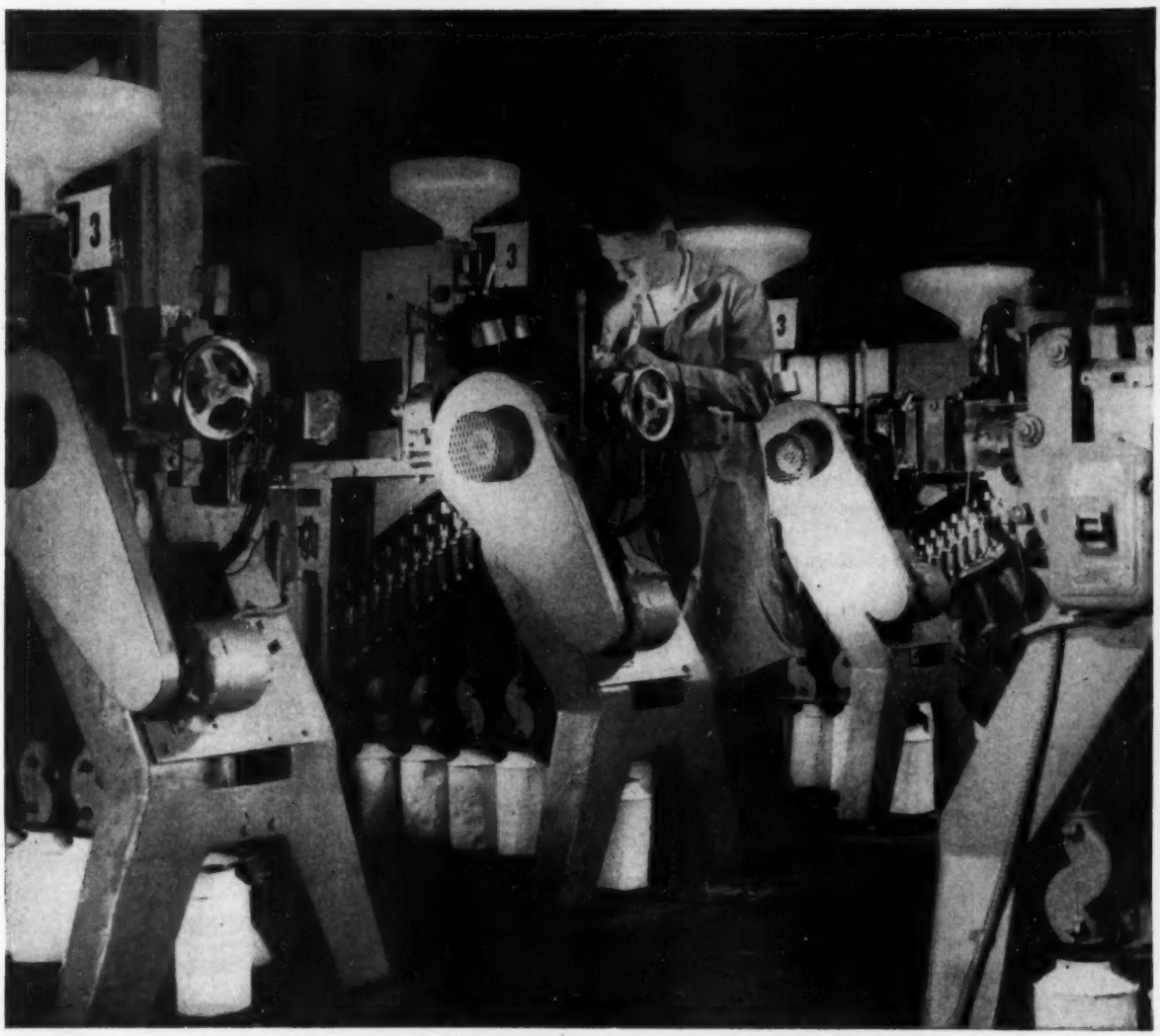
In each and every bearing, we match rollers to almost microscopic limits

NOT satisfied to finish rollers to extremely close tolerances, Timken Company engineers designed the special machines you see pictured below. They sort rollers into even more precise sub-sizes so we can match the rollers in *each* and *every* bearing to almost microscopic limits. Result: each roller carries the same load, assuring quieter operation, longer life.

This is typical of the many extra steps we take to give you more for your money than any other bearing manufacturer. In fact, only with Timken® bearings do you get *all* these advantages: advanced design, precision manufacture, rigid quality control, special analysis Timken steels. The end result is that every Timken bearing insures longer life, reduces friction and cuts maintenance costs to a minimum.

Whether you're buying or building machinery, specify Timken bearings. Or if you're replacing bearings, insist on Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭

BEARING TAKES RADIAL ◫ AND THRUST ⟶◫⟵ LOADS OR ANY COMBINATION ✳

SERVING THE CUSTOMERS OF NEWARK DIE

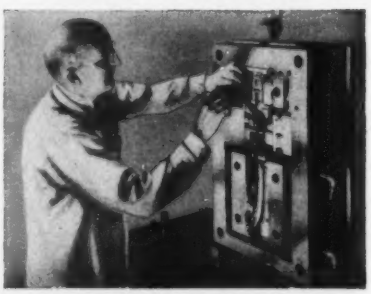
all combine to turn out molds

that meet the most exacting requirements of the molders and users of plastic parts

SPECIALISTS IN MOLD ENGINEERING

THE HANDS OF SKILLED CRAFTSMEN

THE MOST MODERN EQUIPMENT



AND RIGID INSPECTION

At every stage from the study of the blueprints or models for the plastic part to the completion of the finished mold, Newark Die brings to its customers the skill and experience resulting from more than 30 years of precision moldmaking.

Old skills—new machines—turn out the molds that have kept the same molders coming back to Newark Die, year after year. The type of mold, too, that keeps molders' *customers* coming back to *them* year after year.

When You Compare FLEXIBILITY

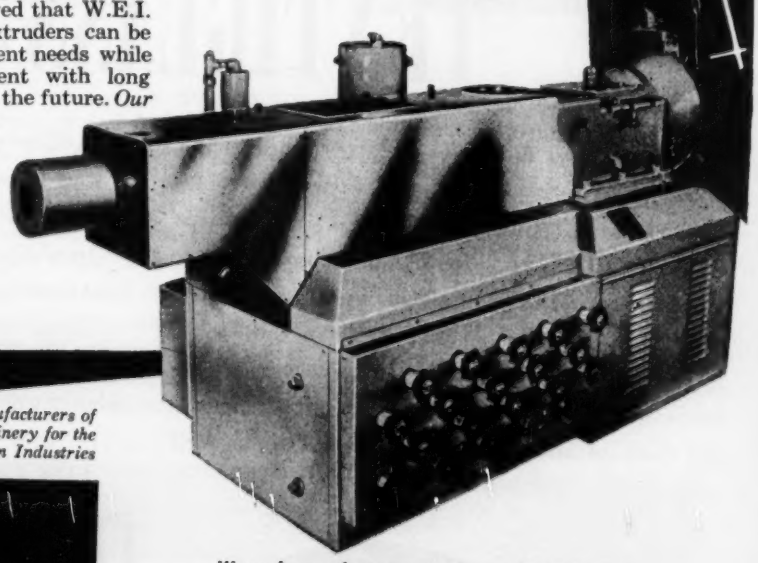
None Compares With The W.E.I.

Compounder-Extractor-Extruder!

On the engineering and production level as well as on the top management level, Welding Engineers, Inc. equipment is a confirmed profit-maker that doesn't know the meaning of "Obsolete"! This outstanding record of performance is based on the unique dual worm design, the almost limitless worm combinations, the capability . . . with only minor modifications . . . to be applied to widely different processes.

The unpredictable future demands of the plastics industry make it all the more important that you know the complete story of Welding Engineers, Inc. one-operation machines before you invest in any . . . regardless of your present processing requirements. *The experience of the leaders* in the field has proved that W.E.I. compounders-extractors-extruders can be custom-fitted to your present needs while protecting your investment with long range profit potentials for the future. *Our wide experience* in solving extrusion processing problems is at your command.

THE UNIQUE DUAL WORM DESIGN MAKES THE DIFFERENCE



Manufacturers of Improved Machinery for the Plastic, Chemical and Petroleum Industries

WELDING ENGINEERS, INC

NORRISTOWN, PENNSYLVANIA

We welcome the opportunity to work with you in solving your compounding and extruding problems

CHENEY BROTHERS

America's Leading Weavers of Fabrics of Exceptional Quality

Air View of the Cheney Textile Mills

NOW PRODUCE TEXTIGLASS FOR REINFORCED PLASTICS

BECAUSE glass fabric for Industry requires the highest possible standards in weaving, The Madagascar Graphite & Mica Co., and Pierre Genin & Cie., of Lyons, France, chose Cheney Brothers to produce Textiglass in America.

This gives Cheney—and American Industry—more than 8 years of technical engineering experience of Pierre Genin & Cie., first to produce both the thinnest and thickest of glass fabric, as well as deep-drawing glass.

Part of the vast Cheney plant at Manchester, Conn. is now in production of Textiglass, coming off the looms under the guidance of master weavers.

In addition, important developments in finishes, and new types of weaves are under way.

Thus, coaters and laminators, independent or corporation divisions can now obtain the most highly quality-controlled glass fabrics.

* * *

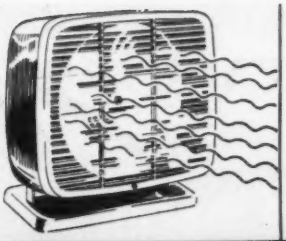
FOR THE FULL STORY WRITE—

Textiglass®

TEXTIGLASS

92 LIBERTY STREET · NEW YORK 6, N. Y.

CABLES: TEXTIGLASS · TEL. CORTLANDT 7-8957



They needed a plastic that was light weight, attractively finished and dimensionally stable.

Molder, Prolon Plastics, Florence, Mass.

KOPPERS POLYSTYRENES

Type 3	General Purpose Polystyrene
Type 7	Improved Heat Distortion Temperature
Type 8	Highest Heat Distortion Temperature
MC-185	High Impact, Lowest Water Absorption Rate
MC-301	High Impact, Improved Heat Distortion Temperature
MC-305	High Impact, Easy Flow
MC-309	High Impact, Highest Heat Distortion
MC-401	Medium Impact, Improved Heat Distortion Temperature
MC-405	Medium Impact, Easy Flow
MC-409	Medium Impact, Highest Heat Distortion Temperature

HERE is a G.E. All-Purpose Portable Fan, winner of the Home Safety, Home Fashion and Industrial Design Awards. The plastic housing is light weight, attractively colored and smoothly finished for easy cleaning. And because of its dimensional stability, Koppers Polystyrene 31 permits an exact fit of the housing and grill.

Whatever your plastic requirements you can depend on Koppers Polystyrene. Koppers makes ten types of polystyrenes, each one for a specific job. If you would like to get qualified engineering advice about the specific Koppers Polystyrene that will help make your product better and help you lower your production costs, call or write your nearest Koppers Office.

Color requirements?

Koppers booklet "Color in Plastics" shows how the science of color engineering is used in the manufacture of Koppers Polystyrenes. Write for your free copy today.

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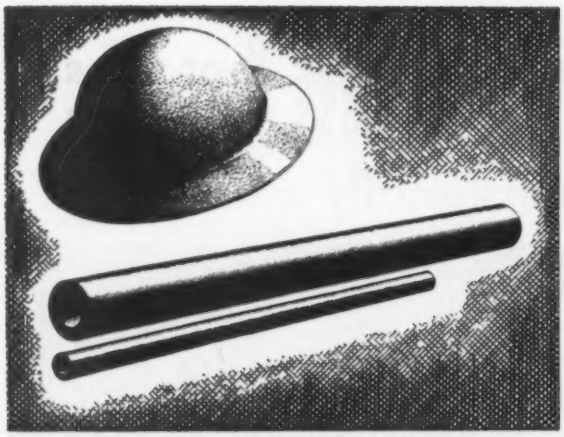
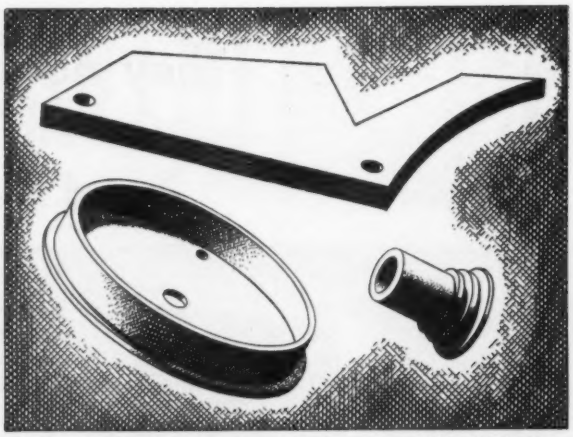
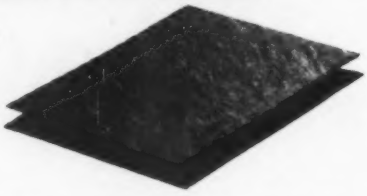


Wellington Sears ducks have the right weight and rugged, hard-gripping texture to make excellent reinforcements for C grade laminates.



Widely used in the electronic and high frequency fields, Wellington Sears spun nylon fabric insures high bonding strength and superior insulation resistance.

YOU GET BALANCED STRENGTH WITH WELLINGTON SEARS "LANTUCK"



Lantuck is a specially developed non-woven fabric which has achieved remarkable acceptance for laminating applications. Because of its completely random distribution of fibers, Lantuck gives laminates equal strength in all horizontal directions and exceptional machineability at high cutting speeds. It is an economical filler for fine gears, textile bobbin heads and other uses involving sharp projections or edges, mirror-like machined surfaces and superior mechanical strength.

We'd like to tell you more about Lantuck and the actual service tests conducted on end-use products. We'd like to review with you other quality Wellington Sears fabrics we have available for the plastics industry. A call or letter to our nearest sales office will do it.

Write for a free copy of "Modern Textiles For Industry" which includes pertinent information on fabric-and-plastic applications. Address: Wellington Sears, Dept. J-6, 65 Worth Street, New York 13, N. Y.

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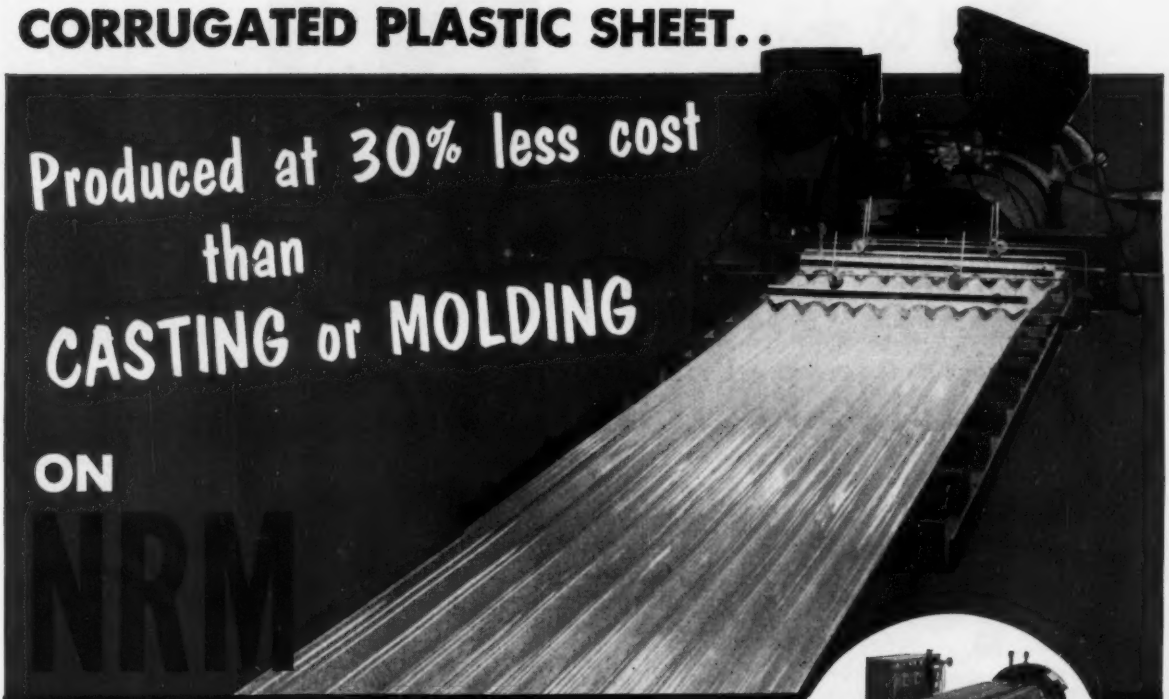
Produced at 30% less cost than CASTING or MOLDING ON NRM EXTRUDERS



NRM 3½" OIL-HEATED THERMOPLASTICS EXTRUDER

Conventional methods of molding or casting corrugated Acrylic sheet required selling prices normally beyond the typical consumer. The manufacturer turned to Southern Plastics Company, Columbia, S. C., for help. "Is there some way to produce this at substantially less cost," they asked?

Southern Plastics' engineers went to work on the problem. The question *they* asked was "Why not extrude?" . . . The photo shows the Acrylic sheet being produced on an NRM 3½" Extruder at the Southern Plastics Company. The complete success of the project is best attested by the substantial reduction the customer was able to make in the price of the sheet.

In discussing the project, Mr. Lindau, President of Southern Plastics Company stated: "Our NRM Extruders played a big part in reducing costs all the way along. We find that we can both *develop* and produce faster and more precisely on our NRM Equipment, than on other extruders in service."

Perhaps some of *your* cast or molded products can be produced at *less cost* by extrusion . . . It's certainly worth investigating, for — as in the case of the Acrylic sheet — such possibilities usually do not suggest themselves. And here's where *NRM* can help . . . Our technical staff will be glad to work with you on any question regarding thermoplastic extrusions or to advise on equipment best suiting your production problems.

From the beginning of the plastics extrusion industry, NRM has consistently furnished producers with processing machinery of most practical design, and worked closely with the industry on most effective use of it. We invite *you* to take advantage of this experience to help work out your plastics problems or ideas. Write today.

2246

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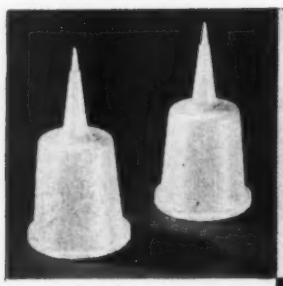
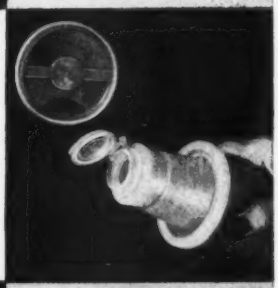
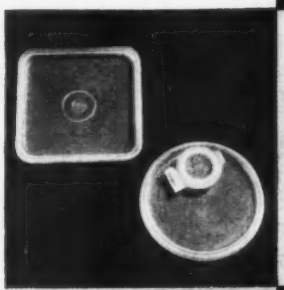


NOBODY HAS AS MUCH EXPERIENCE AT MOLDING POLYETHYLENE AS TUPPER!





Tupper Seals are air and liquid-tight flexible covers. The famous Pour All and Por Top covers are designed for easy dispensing. They are made in sizes to fit all Tupperware containers.

The logical molder for you to consult regarding that product or package of yours which is to be made of polyethylene is Tupper. Tupper has done more than any other molder to make molded polyethylene a practical reality.

Aside from having designed, patented, and promoted successful seals, closures, and dispensers for polyethylene containers, the Tupper Corporation has vast experience in *every phase* of polyethylene packaging and polyethylene injection molding. This experience will be of major importance in improving your product, in reducing your costs, when Tupper goes to work for you.

Tupper's combination of experience, technical ingenuity, and the most modern equipment is at your service for the custom molding of your product in polyethylene. You can do no better than the best ...and the best at molding polyethylene is Tupper!

When equipped with Tupper Seals, Tupper Canisters, Sauce Dishes, Wonder Bowls, Cereal Bowls and Funnels in various sizes are the most versatile reusable containers you have ever seen.

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TUPPER PRODUCTS ARE FULLY PROTECTED

About 150 United States and foreign patents and patents applied for, plus numerous trademarks and copyrights, cover the design and manufacture of the various types of Tupper Seals and other Tupper Products. Unauthorized manufacture of items covered by Tupper patents will subject infringers to prosecution.

Ready to mold *Easier to use*

SUNFORM

POLYESTER PRE-IMPREGNATED GLASS

for Reinforced Plastics

Available in glass cloths from .003″ to .090″ thick — in a variety of weaves and finishes, also woven rovings and special mats.

Solve your low pressure molding problems efficiently and economically . . . with SUNFORM. This low pressure laminating material is *uniformly impregnated* with polyester resin plus catalyst. SUNFORM unrolls like a roll of cloth . . . ready for immediate use . . . nothing to add.

CHARACTERISTICS OF SUNFORM

SHORT CURE CYCLE — Sunform cures completely in 2 to 5 minutes at 250° to 300° F — using low pressures.

EXCELLENT RESIN FLOW — Superior flow of Sunform resin produces void-free laminates even from most intricate and difficult shapes.

STRONG BOND — Sunform laminates are extremely strong, withstanding all normal machining operations with no delamination.

PHYSICAL — High tensile and flexural strengths. Exceptional dimensional stability under extremes of temperature and humidity.

ELECTRICAL — Unusually good electrical properties. High dielectric strength, low loss factor, fine resistance to moisture.

UNIFORM RESIN IMPREGNATION — Mechanically controlled resin impregnation results in better laminates . . . keeps rejects to absolute minimum.

USED FOR ALL TYPES LOW PRESSURE MOLDING — Sunform can be used with matched dies, vacuum bag, pressure bag, contact pressure.

OUTSTANDING HANDLING QUALITIES — Easy and efficient lay-up saves time and money . . . cuts down labor turnover.

CHEMICAL — Common solvents, mild acids and alkalies have little or no effect on Sunform. Resistant to rot, mildew and fungus.

THERMAL — Excellent resistance to heat. Available in both Fire Resistant and Regular types.

LONG SHELF LIFE — Sunform can be stored for 6 months at normal room temperatures up to 70° F. No refrigeration necessary.

Available in colors on large quantity orders.

NEW! -Phenolics!

Phenolic pre-impregnated glass for high temperature resistance is now available.

Learn how Sunform can increase your production and profits. Write, wire or phone today for SUNFORM data and samples.

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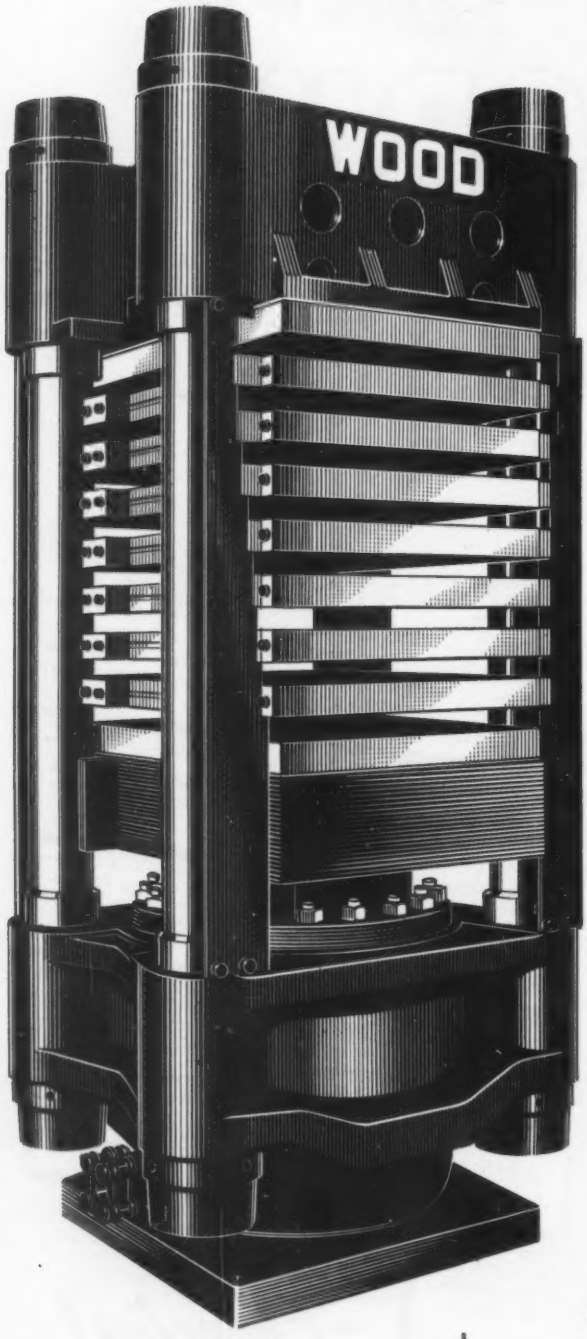

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"... that industrial equipment which has maintained high excellence in manufacture will continue to be sold, and will contribute its worth to uplifting the general quality of everything produced in industrial America ..."

870-ton capacity multiple-opening hydraulic press designed for processing rubber and plastic sheets. *Write for catalogs of our hydraulic presses.*

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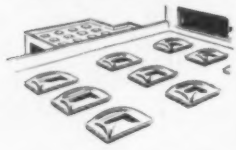
WASCOLITE SKYDOMES ...shed light on 66% Production Savings!



SPEED NUTS® solve fastening problem on new unit for WASCO FLASHING CO.

Wascolite Skydomes, the newest thing in modern sky-lighting, required a more efficient attaching method for installation.

To find the answer, Tinnerman Field Engineers working with Wasco from the design stages, made a Fastening Analysis survey on this new unit. Standard "U"-Type Speed Nuts were recommended to replace clinch type fasteners used in the old design. These Speed Nut Brand Fasteners snap on by hand, are self-retaining in screw-receiving positions, and are ideal for blind locations. The result is a double savings . . . 66% in assembly time, plus a 76% reduction in material and handling costs!

Dollar-saving examples like this show you how Tinnerman can help with your assembly fastening problems. Call our representative for complete Fastening Analysis information. There's no cost or obligation for this service!

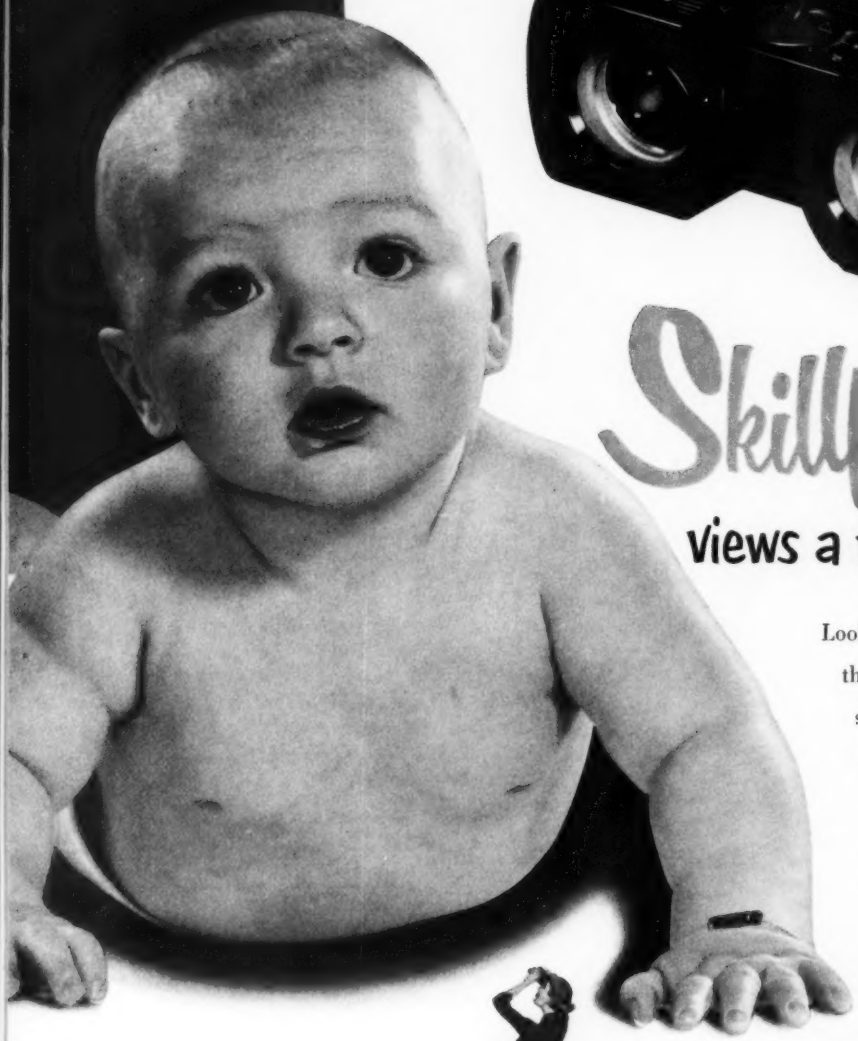
"U"-TYPE SPEED NUTS

These standard Tinnerman fasteners snap over panel edges by hand. They are self-retaining in center hole locations providing quick, easy fastenings even in blind assemblies. A full range of panel thicknesses and screw sizes are available to meet your needs.

Write today for your "Speed Nut Savings Stories" booklet of typical Tinnerman savings to industry: Tinnerman Products, Inc., Box 6688, Dept. 12, Cleveland 1, Ohio.

In Canada: Dominion Fasteners Ltd., Hamilton, Ont. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S. A.—7 rue Henri Barbusse, Levallois (Seine).

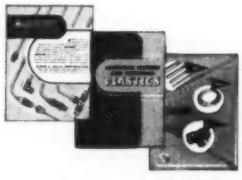
Verascope Stereo Viewer Molded for Busch Camera Corp., Chicago



Skillful Molding views a true-to-life picture!

Look at this viewer and you will see much more than a skillfully molded housing for a superb stereo optics system. You will see another reason why we are especially well equipped to mold your camera and photographic products—or any thermoplastic products for that matter. We can tell you a long story of product molding and engineering accomplishments. There's plenty of variety in this story for we have molded low cost mass production items, as well as outstanding sellers in the luxury price class.

Thus we know how to strike the proper balance of quality and economy that results in a top grade job within your production budget. We'd like to show you how we can do the best custom molding job for you. Let us know today where and when we can tell you our story.



Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about ~~CHILD-PLASTIC~~ piping, tubing and fittings, write for circulars containing data and illustrations.*

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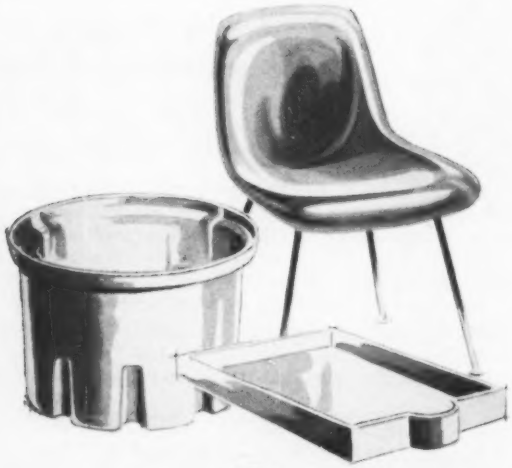
Look to MPc for All Production Techniques Applicable to Fiber-Glass Reinforced Plastics



"Fiber-glass reinforced plastics" is a very general term, applied to a broad range of materials with the most diverse properties...and therefore suited to the most amazing variety of applications.

To begin with, fiber-glass itself is available in many forms...as cloth of various weaves, as loosely woven mat, or as rovings. These materials can, in turn, be impregnated with many formulations of the phenolic, the melamine or polyester resins.

Production techniques also vary widely. Short production runs can be economically produced by means of temporary molds. For large quantities matched metal molds can be employed with either high pressure or low pressure molding. Complex shapes can be molded in two or more pieces to reduce tooling costs. The separately molded pieces are then joined with an adhesive which makes the joint as strong as the molded material itself.

All of these various possibilities come within the scope of **MPc** facilities. Look to **MPc** for help with your advance thinking on fiber-glass reinforced plastics. **MPc** will assist you in developing specifications and making the necessary engineering calculations. Extensive laboratory facilities are yours to use in making all tests required for your product. Address your inquiry to MOLDED PRODUCTS, 4535 W. Harrison St., Chicago 24, Ill.

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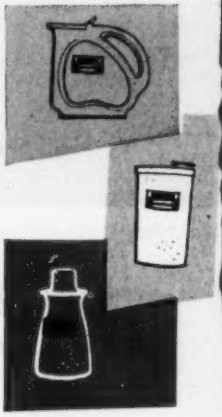


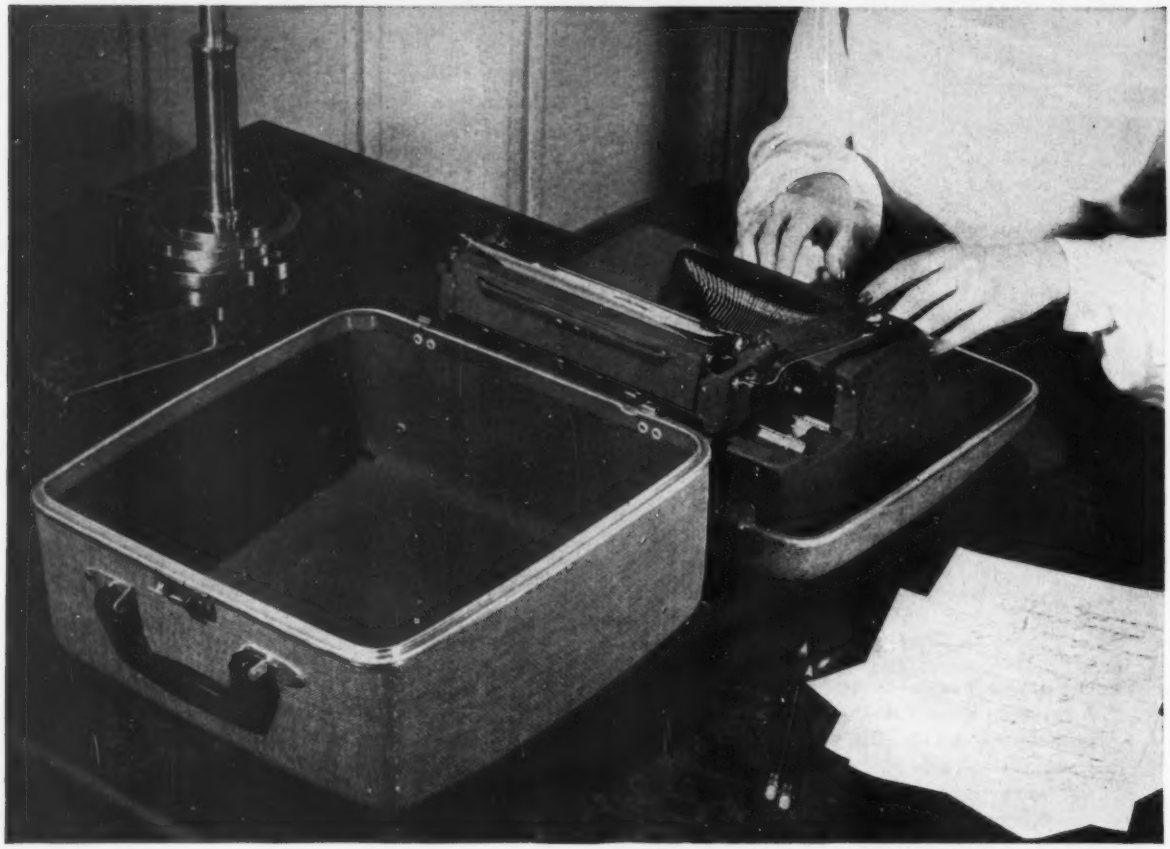
IN THE PLASTICS FIELD—Avery Labels are used to *sell* products in self-service stores. B. W. Molded Plastics Co. puts their sales message right on the product—with an Avery Kum-Kleen Label. In this way, each product is its own silent salesman... no expensive displays are needed...there's no chance of the customer not knowing who makes it, how to use it, or what it's made of. Avery Kum-Kleen Labels stay neat and attractive—right to the consumer—yet they're easily removed without soaking or scraping, and without damage to the surface!

AVERY Kum Kleen LABELS

There's an Avery Dispenser—either manual or electric—especially suited for your particular labeling job. Both models feed individually die-cut labels from rolls, *one-at-a-time*, ready to be applied to any clean, smooth surface — with *production-line speed!*

Another new development using

B. F. Goodrich Chemical *raw materials*



This Royal portable typewriter case is manufactured by Hawley Products Company, St. Charles, Ill. B. F. Goodrich Chemical Company supplies the Hycar latex only.

The Case That Couldn't Be Cracked

PORTABLE typewriter cases live a bang-up life. They have to withstand rough handling, scuffing, even dropping! Tough conditions to meet, but the case pictured here does all this —and more!

The manufacturer molded it from a combination of fibrous glass, melamine resin and Hycar rubber latex, and Hycar gives it impact strength and resilience that provide a vital, extra margin of protection against damage.

In one practical demonstration, this case supported the weight of a 200-pound man without deforming. Then, it was struck repeatedly with a hammer. Examination showed no marks, dents, cracks or other damage.

That's just part of the story: Hycar also provides excellent abrasion resistance and low moisture vapor transmission to the case.

What Hycar does for this typewriter case may give you an idea of how it can help you improve or develop more saleable products. Hycar has many advantages for making molded products, especially in protective coverings to get lighter weight and greater strength than is obtainable in products made from wood or pressed board. Where other qualities are needed, such as resistance to oil, grease, and high temperature aging, Hycar rubber compounds can be made to supply them. We'll help you select the Hycar rubber compound best suited to your needs. For technical information, please write Dept. HV-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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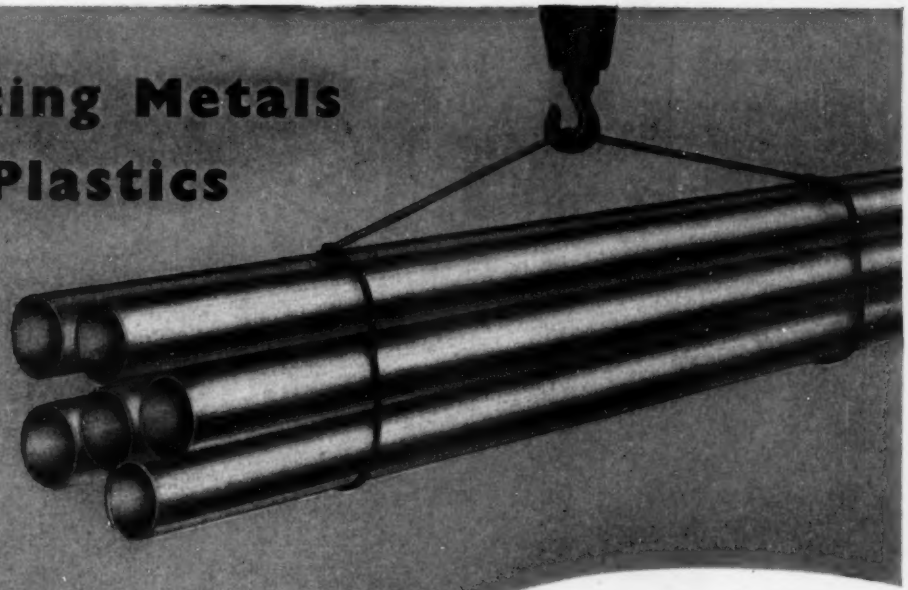

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Industrial plastic pipe of both polyethylene and rigid unplasticised polyvinyl chloride are replacing metal pipes more and more. Plastic pipe has many advantages over metals, particularly for the chemical industry. In addition to its low cost and light weight it affords the opportunity to conserve metals. It is impervious to attack by most acids, caustics and other corrosives.

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The Windsor R.C.100 Extruder producing 6½" outside diameter plastic pipe.
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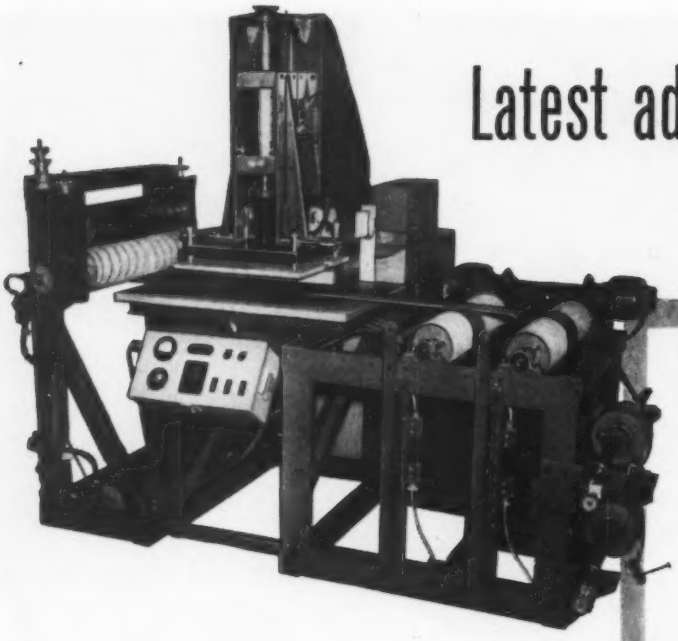

THERMATRON'S NEW AUTOMATIC INDEXER

THERMATRON's new Automatic Indexer is an auxiliary machine that can be attached to any THERMATRON press and generator making a complete unit which will automatically feed, seal, index and wind-up or discharge complete rolls of vinyl sheeting! Consisting of pay-off, take-up and control sections, the entire unit can be attached to existing presses and generators.

FEEDS, INDEXES AND REWINDS COMPLETE ROLLS OF VINYL SHEETING IN ONE AUTOMATIC OPERATION!

THERMATRON

The new THERMATRON Automatic Indexer will speed your production, reduce costs and guarantees accuracy. For further details and specifications write for Bulletin no. 80.

In operation two rolls of material are positioned between cones on the material pay-off shafts and a uniform tension is maintained as the plastic is fed through the press. After sealing the material can be either wound up on a roll or continuously discharged into a bin.

This new THERMATRON unit is completely flexible and can be used automatically or manually—adjustments can be made without stopping the operation by merely turning a hand knob.

Length of index is 6" to 24" with accuracy of index and side registry ± 1/32" approximately. One or two rolls of plastic can be processed with a width of 6" to 24" and thickness of .008" to .020". Longer and wider units are available on special order.

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Economy in molding plastics demands a die steel with tool steel quality and dependability. Such a steel is Cascade . . . the only modern die steel with superior physical characteristics . . . excellent machinability and finishability . . . the pre-hardened steel with uniform hardness throughout.

Specify dependable Cascade for your plastic molds . . . over a hundred sizes carried in stock at all times.

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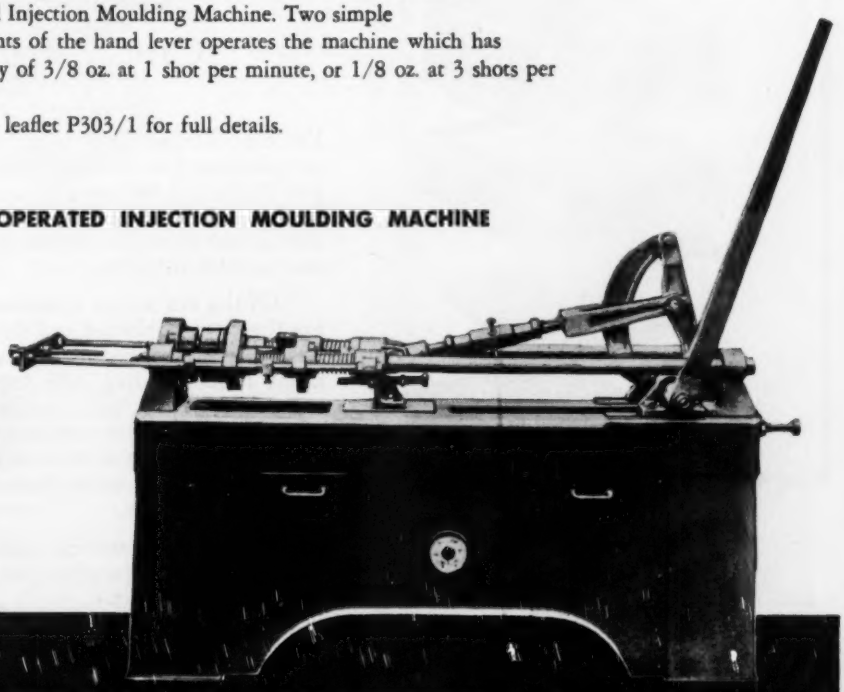
"teed-up" for economic production

Golf tees and similar articles
can be moulded cleanly, crisply and quickly
from Cellulose Acetate, Polystyrene, Polyvinyl chloride and other thermoplastics materials, with the Francis Shaw Hand Operated Injection Moulding Machine. Two simple movements of the hand lever operates the machine which has a capacity of 3/8 oz. at 1 shot per minute, or 1/8 oz. at 3 shots per minute.
Send for leaflet P303/1 for full details.

HAND OPERATED INJECTION MOULDING MACHINE



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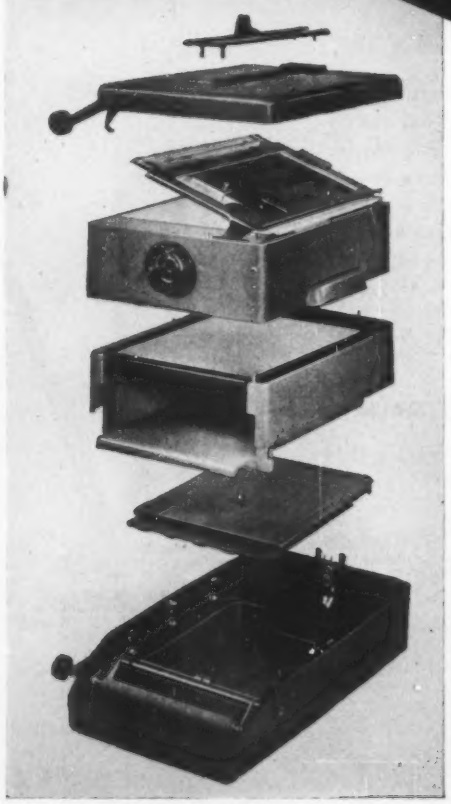
Plastic Facts about KODAK VERIFAX PRINTER



by ERIE

Pioneer in Custom Molded Plastics

Eastman Kodak Company's Verifax Printer is a notable achievement in the simplification of photographic reproduction of letters and other material, and in reduction in the cost of duplication. The Verifax Printer is also a notable achievement in intricate mold design and plastic molding.

Of the six major components the most complicated are the paper cabinet and the printer body. The cabinet has an average wall thickness of 0.156" and has alignment lugs molded into top and bottom to facilitate assembly with other components. The printer body, which rests on the cabinet, has 20 holes molded into the body to contain the electric light sockets. It is one of the heaviest complicated moldings yet done in modified styrene.

Erie, the pioneer in custom molded plastics, is still the pioneer in extending the boundaries of the possible in plastic molding.

Write for your copy of bulletin, "Who We Are . . . What We Do in Plastics."

ERIE TRADE MARK

ERIE RESISTOR CORPORATION . . . PLASTICS DIVISION

Main Offices: **ERIE, PA.**

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HEAT V LIGHT

HARSHAW VINYL STABILIZERS

for the vinyl plastic and coating industries

Important additives for processing and stabilizing clear and opaque vinyls—

CALENDERED FILMS AND SHEETS • EXTRUSIONS
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CADMIUM 2 — V — 4

Leading heat and light stabilizer for clear or opaque stock, an organic liquid complex containing no disadvantageous soapy component. Unequalled for stabilizing against effects of sunlight or outdoor aging.

BARIUM-CADMIUM 128 — V — 5

Leading combination of coprecipitated laurates for outstanding performance, where lubricating advantages are required. Generally 30% more effective than common barium-cadmium laurates.

Best effects are attained for particular requirements by combining 2-V-4 or 128-V-5 in a stabilizing system with one or more of the following three stabilizers.

BARIUM 1-V-4

Compatible barium compound, minimum effect on viscosity. Permits processing at higher temperatures.

ORGANIC 7-V-2

Epoxy assistant, highly effective HCl-scrubbing agent, undiluted. Will extend stability for longer processing periods.

ORGANIC 8-V-1

Chelating agent, more than two times as effective as common organic phosphites. Inactivates harmful by-products to boost stability. Contributes to top clarity.

Stabilizing Systems developed for Harshaw Customers, for special processing and finished product properties, may contain one of the following eleven stabilizers.

ZINC 9-V-1: Organic liquid complex containing no disadvantageous soapy component, used in selected formulations.

CADMIUM 24-V-1: Organic liquid complex for highest attainable clarity, used principally with dispersion resins.

CADMIUM 2-V-8: Selected laurate, used principally with low fusing resins.

BA-CD 12-V-5: Coprecipitated laurate.

ORGANIC 7-V-1: Epoxy assistant, modification of 7-V-2.

ORGANIC 8-V-3: Useful with particularly sensitive organic colors.

BARIUM 1-V-1: Modified ricinoleate, used in a few organosol formulations.

BARIUM 1-V-3: Dispersible stearate, to contribute lubricity with barium effects.

CADMIUM 2-V-5: Dispersible stearate, to contribute lubricity with cadmium effects.

CALCIUM 5-V-1: Dispersible stearate, to contribute lubricity with calcium effects.

CALCIUM 5-V-2: Low melting stearate, to reduce internal friction effects.

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THE HARSHAW CHEMICAL CO.
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AVAILABLE **NOW!**

As thin as

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UP TO 60" WIDTH

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VIRGIN POLYETHYLENE

POLYETHYLENE TUBING and SHEETING

Uses— FOOD and DISPLAY PACKAGING, CARTON and BARREL LINERS.
Non-Toxic, Odorless, Resistant to Alcohols and Most Acids.

- ***maximum Clarity***
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Perfected TO OFFER GREATER ECONOMIES

AMPLE SUPPLIES! IMMEDIATE DELIVERY!

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EXTRUDED PRODUCTS DIVISION

100% EQUIPPED with EEMCO PRESSES for production of CHEVROLET CORVETTE BODIES

THE MOLDED FIBERGLAS BODY CO., of Ashtabula, Ohio, producers of Chevrolet Corvette Bodies, use EEMCO presses exclusively. There's a reason —contact Erie Engine & Mfg. Co., for full particulars.

One of the lines of EEMCO presses in Molded Fiberglas Body Co.

EEMCO

ERIE ENGINE & MFG. CO.

Builders of presses and mills for the rubber and plastics industries

12th St., & East Ave., ERIE, PA.

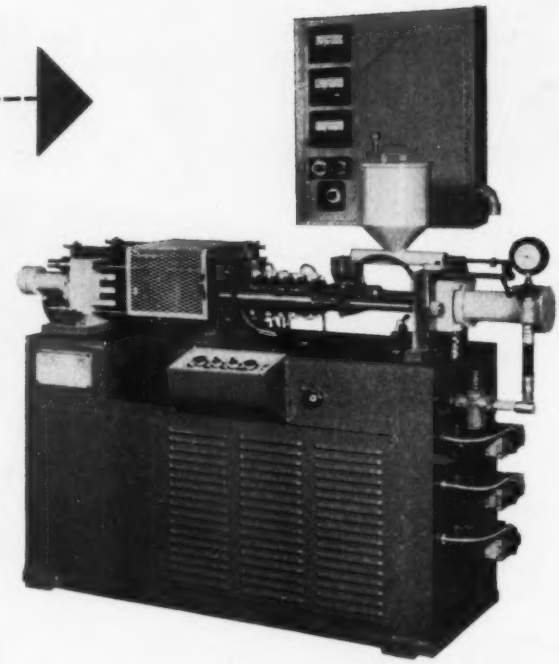
Introducing the New

MOSLO MODEL 73 ..Two Ounce.. PLASTIC INJECTION MOLDING MACHINE

★ High Speed—1200 Shots Per Hour

★ Completely Automatic

★ Hydraulic Operated



★ Here is the answer to high-speed injection molding at a low mold cost. The Moslo Model 73 is a sensational, all-new, plastic molding machine—revolutionary in design, outstanding in performance. It incorporates the most recent engineering advancements in completely automatic injection molding. Rated at 1200 cycles per hour (dry run) it will shoot a full two ounce shot. The Model 73 is comprised of two separate units—the beautiful, compact machine and a sturdy, easily accessible, wall mounted control cabinet. Ideal for long runs of small pieces at high speed operation, plus small mold cost the Model 73 is just the machine that custom molders have been wanting.

Compare these features, investigate, and you'll buy!

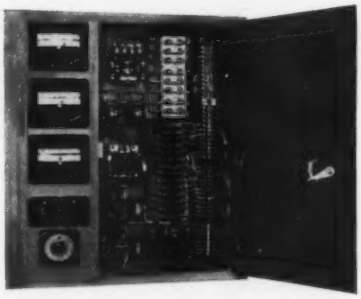
THE MODEL 73 MOLDING MACHINE FEATURES . . .

- Horizontal Construction
- Four tie rods with micrometer adjusting nuts for even distribution of pressure on four points of toggle clamp
- Welded base of heavy-gauge steel
- 45 gallon oil tank
- 5 H.P. motor
- Vickers hydraulic pump and heavy-duty oil heat exchanger
- Two pressure hydraulic system so if part is not ejected machine shuts down without damaging mold
- 25 pound per hour plasticizing capacity
- Adjustable control injection speed
- 14 pound capacity metered-type hopper
- 8 x 9 inch DME mold blanks are employed
- 20 square inch plus molding area
- Water-cooled injection piston plus top half of material receiving funnel
- Even heat distribution and flow of material obtained with Moslo 'Radeo' torpedoless stainless-steel material cylinder
- Cushioned hydraulic action at end of the forward and reverse strokes of clamping cylinder-parts ejected gently
- When safety gate is open, mold automatically opens—protecting operator and mold
- Push button panel on machine contains automatic and manual controls

Both the control panel and machine are shipped complete and ready for immediate installation.

The Model 73 is manufactured entirely in the United States using standard electrical equipment and controls that are readily serviced in major cities.

The Model 73 Control Panel Features . . .



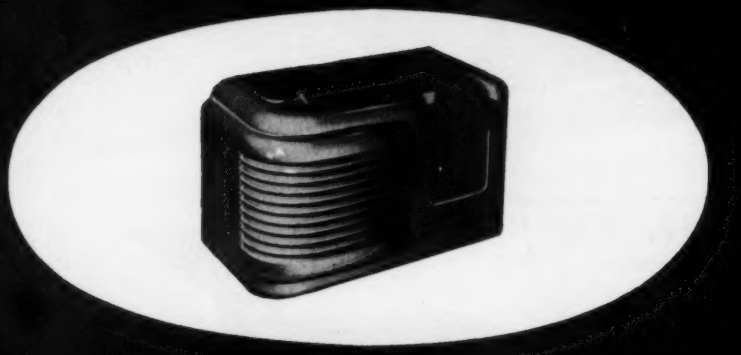
- Independently fused circuits for all controls, the motor, and the heating cylinder
- All wiring is color-coded and properly marked
- 3 West Instrument Company Gardsman proportioning instruments: one controls rear heat, one controls front heat, and one controls nozzle temperature
- Four timers for controlling the time cycle, one Cycle-Flex timer for over-all cycle, one Cycle-Flex timer for first injection stroke, one Micro-Flex Counter timer for stuffing and one Allen-Bradley Repeat Cycle timer for fully automatic operation.

PLACE YOUR ORDER NOW FOR EARLY DELIVERY

MOSLO MACHINERY COMPANY

2443 PROSPECT AVENUE • CLEVELAND 15, OHIO

for **TOUGH** molding jobs . . .



METASAP* STEARATES deliver easier mold release

When you have a tricky molding problem . . . when you're deep drawing or producing large pieces, Metasap Stearates in the molding compound provide outstanding lubrication for easy ejection from the mold.

Either incorporated into the molding compound or dusted onto mold surfaces Metasap Zinc or Calcium Stearates give outstanding lubrication so that lower ejection pressures are needed. Thus, you can expect increased output, fewer rejects, improved finished products and longer mold life.

So specify compounds containing Metasap Stearates or incorporate them directly into your own molding compound. Metasap Technical Service will help you with the proper material and mixing procedure for your needs.

. . . and to produce economical plastigels

As a thickening agent for plastisols, Metasap provides a complete line of quality Stearates. We'll be glad to make available to you free experimental samples of Magnesium, Barium, Calcium and Aluminum Stearates. They are ready for immediate shipment now.

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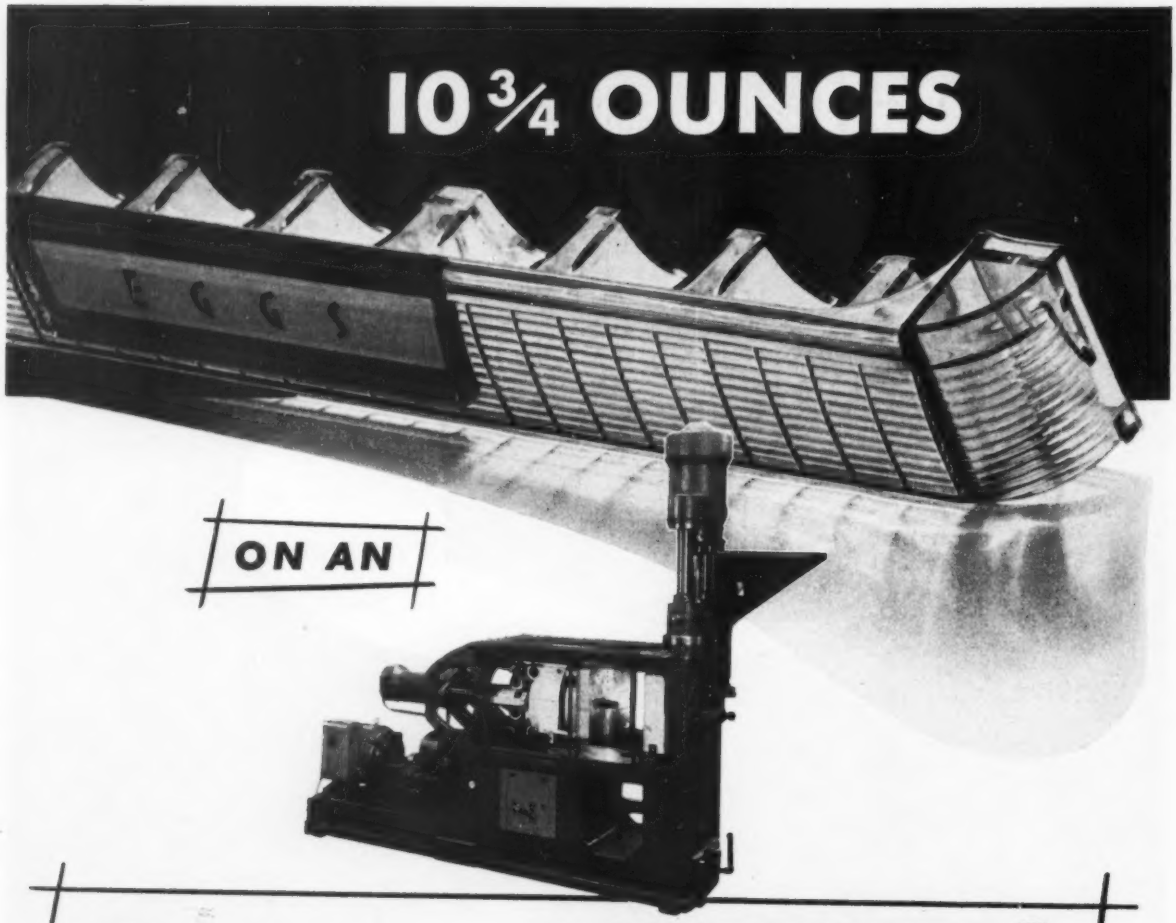
Stearates

of Calcium • Aluminum • Lead • Magnesium • Zinc

10 3/4 OUNCES



ON AN

8 OUNCE LESTER!

AT SINKO MFG. AND TOOL CO. in Chicago, if you ask Howard Nielsen, Treasurer and General Manager, about the new L-2-8 ounce Lester, he'll tell you, "what a lifesaver." When they had to run the polystyrene egg-tray compartments shown here for the Admiral refrigerator, the 32 ounce press where it usually runs was loaded. Even though the part weighed 10-3/4 ounces in polystyrene, they decided to try the mold in their new Lester to see what would happen. They saw! It started running and they were in production—and at a cycle competitive to the 32! What a wonderful feeling for a molder to know that his machines have that extra capacity in a tight spot.

The 8 ounce Lester is rated in polystyrene and has 350 tons of locking pressure. It will take an 1823 DME mold base. Write for complete specifications on the machine whose capacity is suited to your needs. And ask for a free copy of the Lester-Phoenix house organ, "The Lester Press".

LESTER INJECTION MOLDING MACHINES

REPRESENTATIVES

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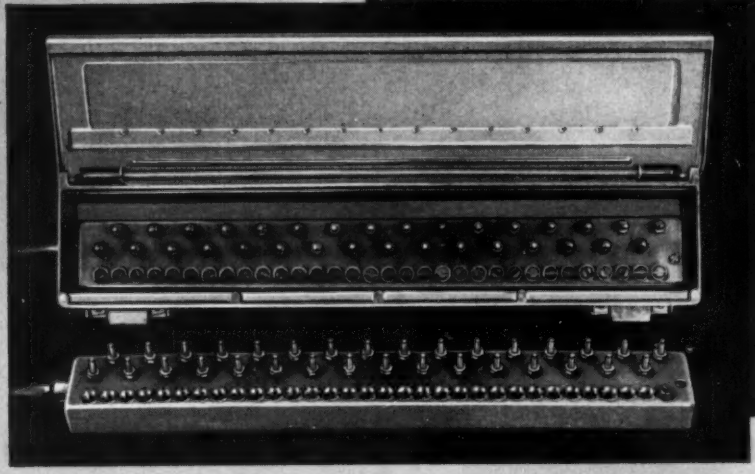
From molded chairs of modern design to cast resin cable terminals . . .

Pittsburgh Selectron

POLYESTER RESINS



MORE AND MORE manufacturers are turning to Pittsburgh SELECTRON Polyester Resins to make their products better looking, stronger, more durable —and often at lower cost.

● **For example,** the Zenith Reinforced Plastics Company of Gardena, California, uses SELECTRON in manufacturing prize-winning Charles Eames armchairs for the Herman Miller Company of Zeeland, Michigan. No costly metal stamping tools are needed to make them. These chairs are molded with color imbedded, requiring no additional protective or decorative finishes.

● **In its Point Breeze, Maryland,** plant the Western Electric Company uses SELECTRON Resins to make telephone cable terminals of a completely new design that provides several important advantages over earlier types.

● **These resin-cast terminals** are gas-tight, prevent moisture from getting into the cables and facilitate the finding of open breaks. They have high surface resistivity and are free from cracks and pits in which dust and moisture might lodge. Protectors are integrally mounted instead of being placed alongside. Thus, substantial savings in manufacture, installation and service are effected.

● **SELECTRON,** when combined with such fillers as Fiberglas, cotton, rayon, nylon, felt, sisal, paper, etc., provides a new kind of material that is lighter than aluminum, yet—weight for weight—is stronger than steel. It has great impact resistance and withstands the deteriorating effect of weather, sunlight, heat, abrasion and many chemicals.

● **SELECTRON Resins** offer many possibilities to alert, progressive manufacturers. Why not call on us for advisory service? We'll be glad to have one of our engineers discuss your problems with you at no extra cost or obligation.

• • •

PITTSBURGH PLATE GLASS CO., Industrial Paint Div., Pittsburgh, Pa. Factories: Milwaukee, Wis.; Newark, N. J.; Springdale, Pa.; Atlanta, Ga.; Houston, Texas; Torrance, Calif.; Portland, Ore. Ditzler Color Div., Detroit, Mich. The Thresher Paint & Varnish Co., Dayton, Ohio. Forbes Finishes Division, Cleveland, Ohio. M. B. Suydam Div., Pittsburgh, Pa.

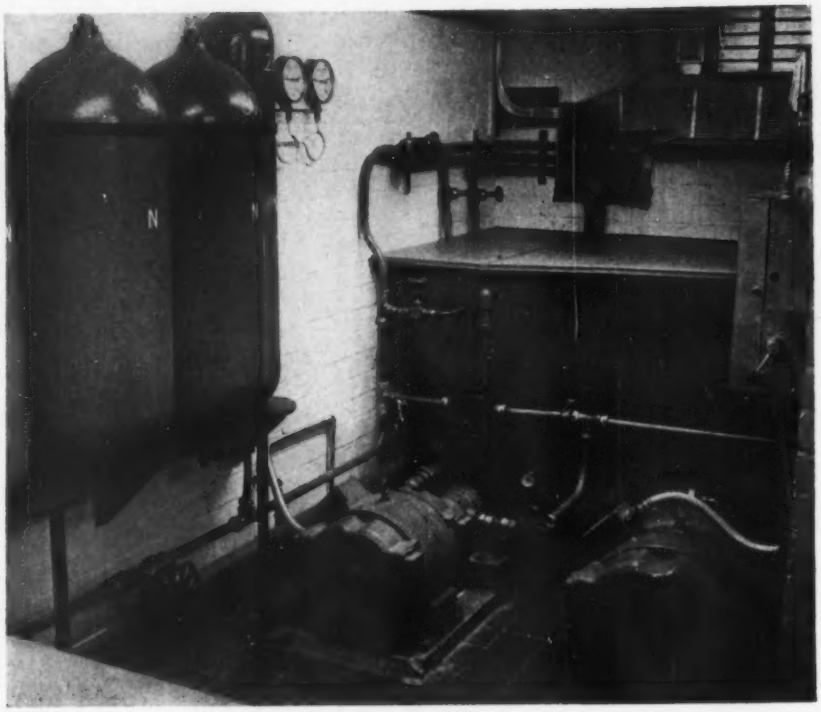
Just a few products in which Pittsburgh SELECTRON Resins are now used—

Aircraft structural parts
Radomes for electronic equipment
Life floats
Ballistic panels
Helmets
Boat hulls
Machinery housing and guards
Trays
Tote boxes
Food lockers
Garbage pails
Baskets for automatic dishwashers
Baskets for automatic washers
Wash tubs
Tool chests
Shipping containers
Instrument cases
Laundry hampers
Kitchen containers
Fishing rods
Sinks
Street signs
Traffic signs
Fluorescent light fixtures
Television cabinets
Loudspeaker housings
Gas meter housings
Structural panels for offices and homes
Door and transom lights
Awnings and canopies
Greenhouse panels
Skylighting
Molded chairs
Prefabricated houses and garages
Truck bodies

PITTSBURGH Selectron

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY



This system is the most economical ever devised to drive a press installation

BY THE NOVEL expedient of using medium line pressure (1000 psi) in combination with in-the-press intensification, the BIPEL drive system provides its users with extremely low cost, highly flexible motive power. Since high pressure is avoided until the hydraulic fluid is in the press, the pumps require less horsepower, the piping needs less thickness, and the valves and other components are lighter and less expensive to purchase, to install, and to operate.

The unit shown is one of four such, installed in a single space-saving underground chamber. A combination of any three can drive up to sixty presses. Intensification by BIPEL's dual range intensifiers can step up the pressure to 2000 psi or to 3000 psi, giving each press a range of three pressures from this single power source. The BIPEL system is protected not by a relief valve but by a novel unloading valve which does not permit circuit pressure to build up or drop beyond selected limits.

While the BIPEL drive system is designed especially for use with BIPEL "auto control" presses which reproduce any possible molding cycle automatically, it is also most advantageous with manually cycled presses. A miniature of the drive may be built into the press frame for individual press operation.

The flexibility and economy of the BIPEL drive system should be reflected in significant increases in productivity and profits. We will be pleased to send you full information on BIPEL drives for use with BIPEL presses, or for use with your present press equipment.

Address American inquiries to
Ralph B. Symons Associates, Inc.
3571 Main Road
Tiverton, Rhode Island

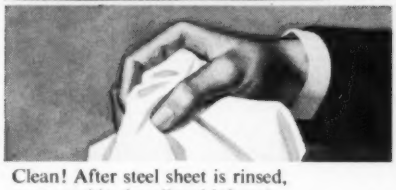
B·I·P GROUP

B. I. P. ENGINEERING LTD.
Aldridge Road, Streetly, Staffordshire, England

Read What RHEEM Does to Help Solve Your Shipping Problems!

Rheem sets the standard for the entire steel container industry by taking care in preparing its steel for fabrication. Rheem provides clean, long-lasting drums.

Every minute particle of oxide "scale" is removed by Rheem shot-blasting, stopping rust and corrosion for years of dependable service.



Clean! After steel sheet is rinsed, even a white handkerchief can't find a trace of soil or contamination.

RHEEM DRUMS ARE CLEANER!

Shot-blasting process removes troublesome oxide "scale" from both sides of each steel sheet and leaves a clean, oxide-free surface. Then each sheet is rolled and leveled to insure a smooth, even surface necessary for precision roller-coating. Next, detergents, scalding water and revolving brushes scrub it clean. After rinsing and drying, the sheet is ready for further treatment.

RHEEM DRUMS LAST LONGER!

Once clean, each sheet is treated on both sides with a patented phosphoric compound to inhibit rusting. This is one more important step in Rheem's careful preparation of its steel to insure uniform adherence of the drum lining. This also makes it possible for Rheem Drums to withstand long periods of weathering. Finally, when required, special coatings are roller-applied and baked on to produce a tough, durable finish that protects your product from contamination.

Free Folder! *Write today to the nearest Rheem Manufacturing Office listed below for your free copy of informative folder on Rheem Drums.*

ATTENTION SHIPPERS!

Rheem has a complete line of special drum linings for a variety of products. But if your product requires a unique lining, Rheem will develop it for you. Each of Rheem's seven strategically-located container plants has complete laboratory facilities. Expert chemical engineers who have solved container problems for many of America's largest shippers will help you. Call or wire the office nearest you!

Rheem

Rheem Manufacturing Company

World's Largest Manufacturer of Steel Shipping Containers

RICHMOND, CALIFORNIA • SOUTH GATE, CALIFORNIA • HOUSTON, TEXAS • CHICAGO, ILLINOIS

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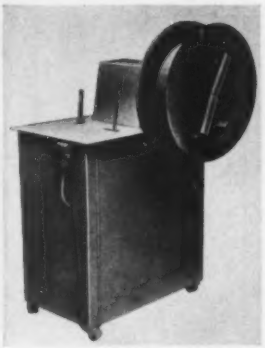
ROBBINS

PLASTICS EXTRUSION HANDLING EQUIPMENT

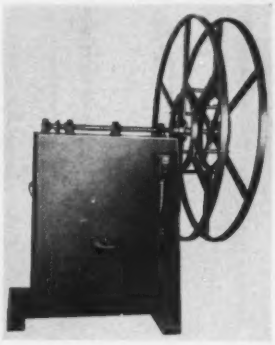
VARIABLE SPEED WINDER

This versatile Robbins Winder can help solve many extrusion winding problems. Designed primarily for use with any diameter spool, it has a speed range from 0 to 200 ft. per minute. It is exceptionally sensitive to finger touch control—the tension is adjustable so the slightest pressure will stop the spool at any speed.



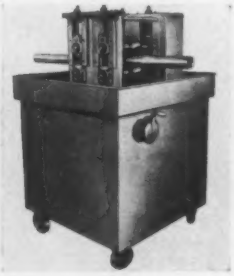
- **Foot control available**
- **Machine reversed by moving a single lever**
- **Automatic lever-wind unit optional at additional cost**

PIPE COILING MACHINE



Here is a Robbins designed and built unit which meets the requirements of many producers. Quickly and efficiently, it makes a neat coil of any pipe from ½" to 3". Basic equipment includes 3 small reels and 2 large reels which can be changed in a matter of seconds.

- **Powered with a U. S. Varidrive motor**



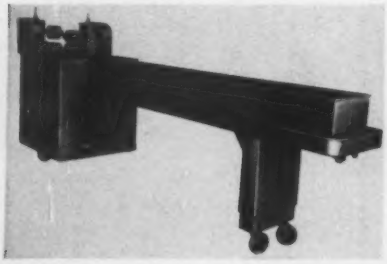
PIPE PULL-OFF UNIT

This unit is adjustable to handle pipe from ½" to 6" diameter. Dual rollers prevent slippage. The bottom roller runs in a water bath to insure proper cooling. The height of the take-off is adjustable from 36" to 44".

- **Convertible to a capstan by merely changing rollers**
- **Supplied complete with U. S. Varidrive motor and switch**

TAKE-OFF CONVEYOR FOR VACUUM FORMING

This machine can be supplied in any width or length

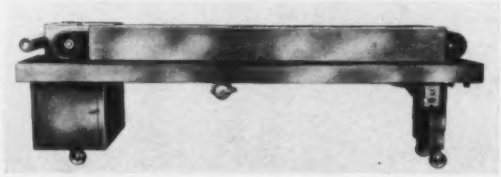


DOUBLE CONVEYOR EXTRUSION TAKE-OFF

The Robbins "Cap-Stan" Double Conveyor Extrusion Take-Off can increase extruder output by up to 30% when dual orifice dies are used. By controlling the speed of each shape individually as it leaves the extruder, this unique unit permits utilization of full machine productive capacity.

- **Proven reduction of scrap losses**
- **Equipped with splash pan and water tank 10' long**
- **Available with up to 4 heads**
- **Rollers are adjustable to 1½". Top roller runs at angles up to 15°.**
- **Choice of Reeves or U. S. Varidrive motor.**

EXTRUSION TAKE-OFF CONVEYOR



Rigid construction allows embossing, pinking or slitting units to be mounted at front, eliminating secondary operations.

This Robbins Conveyor can be supplied with any width belt. It has two extra rolls in the water tank so that the material can be run over the belt, down through the water tank and back over the belt as many times as needed for efficient cooling.

- **Rigid all welded construction. Mechanism easily accessible for maintenance**
- **Powered by U. S. Varidrive motor**

CHECK ROBBINS FOR

- **Specialty dies such as refrigerator gasket dies**
- **Pipe dies for rigid and flexible materials**
- **Sheeting dies and take-off equipment**
- **Sizing equipment of all types**
- **Self-contained refrigerated water tanks**

Robbins engineers, lays-out and supervises the construction of complete extrusion plants

ROBBINS TOOL & DIE CO.

PLASTICS EXTRUSION DIES A SPECIALTY

Office: 519 Maple Row Plant: 1430 Mishawaka Elkhart, Indiana

tailor-made by General American

Plexiglas globe—big enough to hold a man—is molded in two sections on General American's battery of 300-oz. injection presses.

Plastic Armor for General Electric's Fluorescent "Six-Footers"

Huge fluorescent fixtures encased in hard, clear plastic are the big news in outdoor lighting.

To make the installation of their new "luminaires" practical, General Electric needed a globe big enough to hold four 6-foot fluorescent tubes, and tough enough to protect them against wind, weather and small boys' marksmanship.

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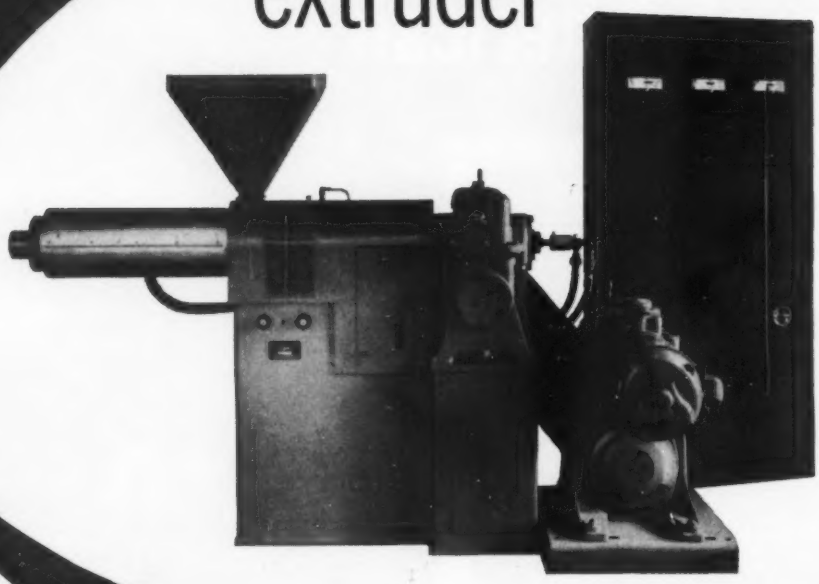
Egan

extruder



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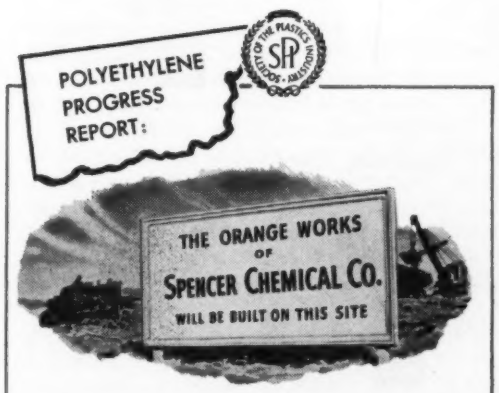

Construction is under way at Orange, Texas, on Spencer's new $14,000,000 polyethylene plant. Upon completion in 1955, Spencer will become one of America's major producers in the fast growing polyethylene field.

If formaldehyde is one of *your* raw materials, there are two good reasons for ordering from Spencer:

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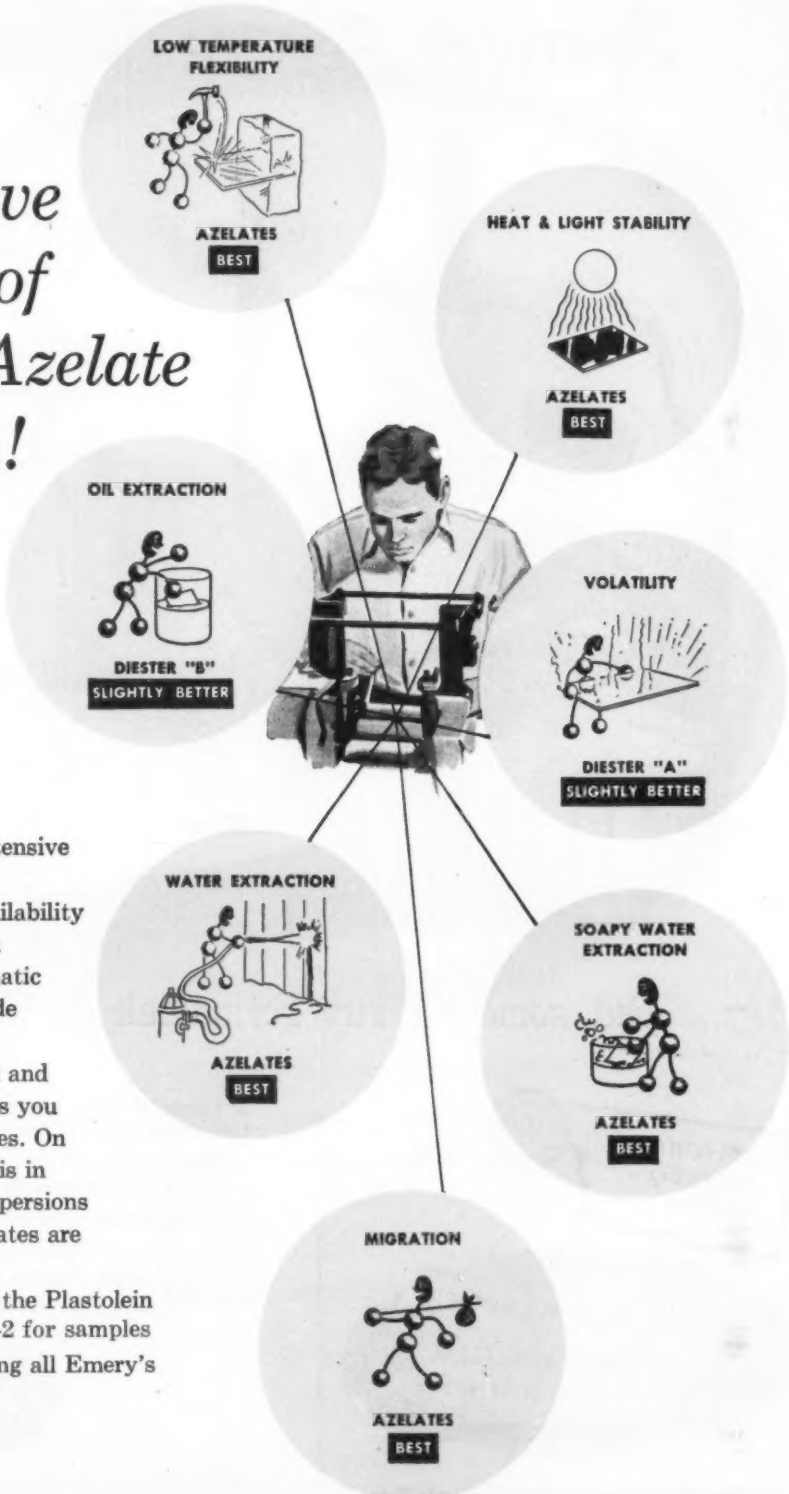
Tests Prove Superiority of Plastolein® Azelate Plasticizers!

DIRECT COMPARISON PROVES ADVANTAGE OF AZELATES OVER OTHER ALIPHATIC DIESTER PLASTICIZERS!



It will pay you to start an extensive evaluation of the Plastolein Azelate Plasticizers. With availability increasing, the choice between these Azelates and other aliphatic diester plasticizers can be made on performance alone.

Check the points illustrated and see for yourself the advantages you get from the Plastolein Azelates. On a performance versus cost basis in films, sheeting, extrusions, dispersions and coated fabrics, these Azelates are your best buy today.

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MODERN PLASTICS

The Job to be Done in REINFORCED PLASTICS

SEVERAL important new market surveys point up what everyone who ever had anything to do with reinforced plastics has always held: that potential markets for these materials are wondrous in both size and variety.

But potential markets are only possible markets, not probable—unless and until the industry does something to make them so.

This may be done best and most quickly by facing up to the facts about our present materials and methods, our present research programs and marketing schemes.

In reinforced plastics materials themselves we have, on the positive side:

1) Inherent corrosion resistance.
2) Basic insulation, both thermal and electrical.
3) A relatively high strength-weight ratio.
4) The feasibility of molding large shapes.
5) The possibility of economical production.
6) Colorability in both opaque and translucent form.

Yet, during the past year we have noted the following negative factors:

1) Mechanical deterioration of parts under static loads at elevated temperatures in the presence of water.
2) Creep of materials under conditions of weight, strain, or vibration.
3) Finishing problems galore, particularly where a part is subject to movement, strain, or friction.
4) A continuing dearth of reliable design data on nearly all composite materials.
5) A serious need for sunlight-resistant resins that will also stop fire.
6) Fabricating techniques that are often far from economical in volume production for mass markets.

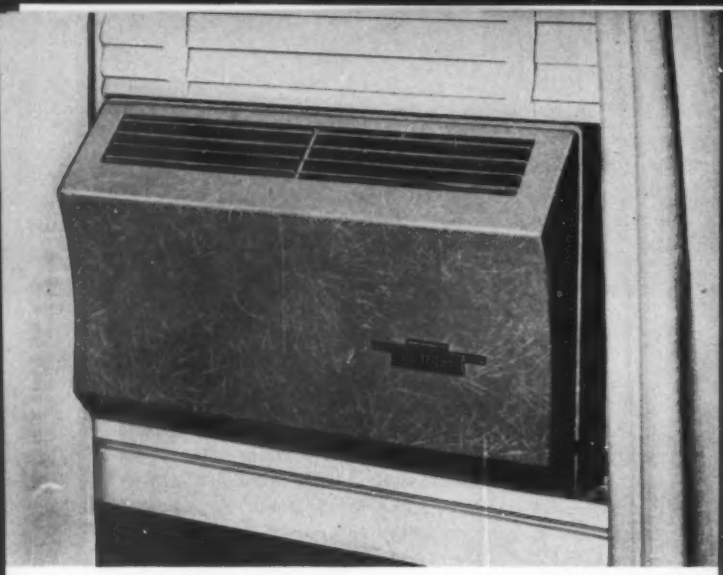
Reading between the lines of the above, any reinforced plastics man may relate these negative factors to his own problems. The problems in pipe manufacture, in the engineering of large tanks, in glazing materials, in chemical applications, are all bound up herein.

Much work has been done to overcome these problems—and much remains to be done. Faults lie with customers, molders, and reinforcement and material makers. Too often a customer is not sure of what he wants or what properties the finished product will need to have. Too often a molder will hope to "doctor" material to suit a job. Too often a material maker will not be fully sure of a resin before he permits it to be used. Too often there is the need for an expensive and lengthy product development job, with nobody to finance it.

There are even polemics on economic philosophy in the industry on the points of minimum and maximum runs, production methods, etc.

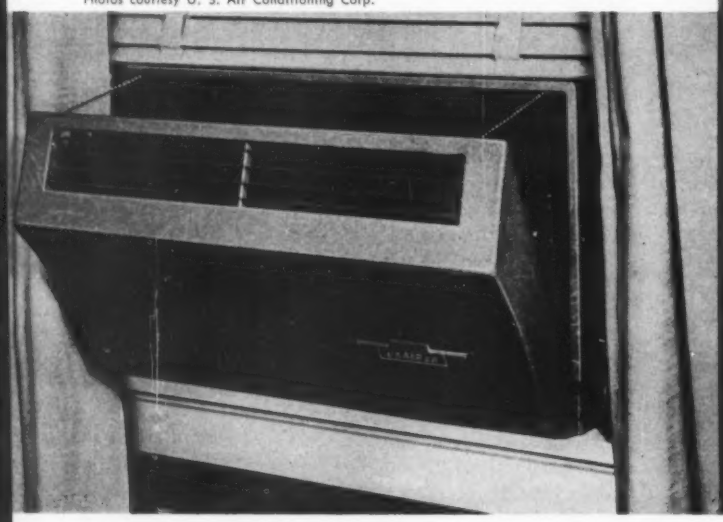
We have some editorial opinions on these matters, which are offered herewith:

1) We need standards on all composite cured materials of all kinds; standards that may be related back to materials and methods of using them.
2) We need more attention to molds and molding methods, because in many cases we are not taking advantage of the speedy cycles permitted by polyesters.
3) We need engineering data related to the above two points—the standards and the methods.
4) We need studies of the alloying possibilities of all resins in the reinforced plastics field, to give us more versatility.
5) We need study on the possibilities of combinations in reinforcement, for the same purpose.
6) We need more study of treatment of reinforcement for indefatigable bonding of materials in finished structures.
7) We need a more cautious approach to product development so that we shall not be like Stephen Leacock's young man who "leaped into the saddle and galloped madly off in all directions," but will concentrate on applications within the powers of our present materials while developing better materials for more difficult applications.
8) We need to maintain our historic attitude toward swapping of know-how, because only thus may we build a strong and balanced industry.
9) We need to strengthen our present molding industry both capital-wise, facility-wise, and personnel-wise.
10) We need to watch for new markets which might not be exposed in the surveys, and we need to be opportunists enough to serve them when they are found.
11) We need to teach designers to use these materials properly.
12) We need to be mighty careful about publicity on jobs that take time to test.



Rugged reinforced plastics interior cabinet of window-type air conditioning unit extends only 2 in. into the room (above). In keeping with modern styling of the unit, the hinged cabinet swings open at the top (below) to provide access to the concealed push-button control panel

Photos courtesy U. S. Air Conditioning Corp.

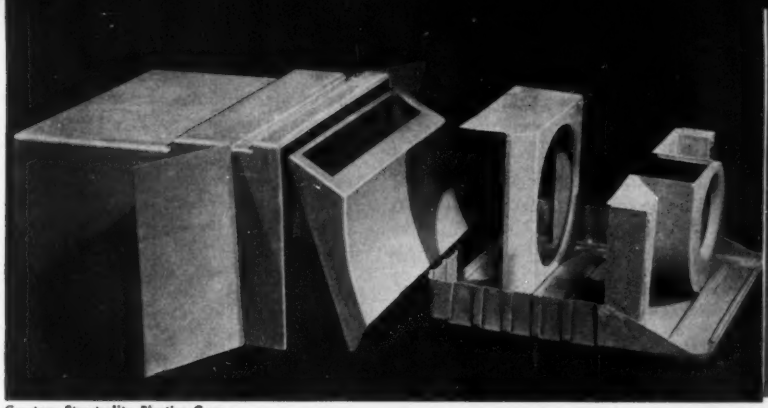


Better Air Conditioners Use More Plastics

Preform for the large reinforced plastics exterior cabinet of the unit illustrated above is made in 6-ft. preform machine

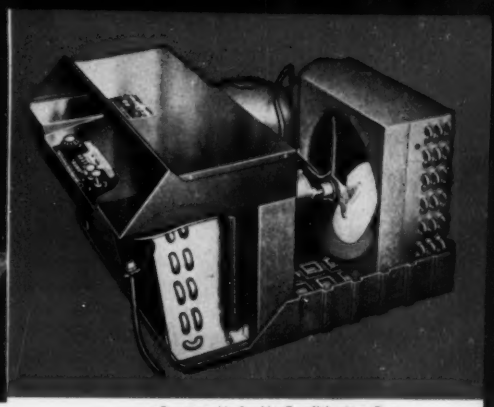
One-piece exterior cabinet, which includes molded-in groove for window sash, is removed from the 100-ton compression press

Photos courtesy Structurlite Plastics Corp.



Courtesy Structurlite Plastics Corp.

Seven reinforced plastics parts of air conditioner include (left to right): exterior cabinet, two side window wings, interior cabinet, base pan, fan housing, and partition



Courtesy U. S. Air Conditioning Corp.

Plastics parts in internal construction of unit provide superior sound and thermal insulation

SUCCESSFUL introduction of two window-type air conditioning units with molded reinforced plastics cabinets and internal parts has opened a completely new area of the room air conditioner market to the use of plastics materials.

Before the introduction of these two units, primary use of plastics in this field was in grilles, side panels, and those parts of the cabinets which extend into the room. Exterior cabinets which project outside the building, as well as the majority of the internal structural components, were traditionally fabricated of metal.

Now that room air conditioners are being made with reinforced plastics housings, the picture has changed completely. For the first time, plastics have been applied—with notable success—to exterior cabinet design as well as to internal construction.

As leaders in the field predicted early last year (see "Room Coolers," MODERN PLASTICS *30*, 95, April 1953), the manufacturers of the window-type unit in 1954 are faced with a lot more competition than ever before in the history of air conditioning. By the summer of 1954, it is estimated that the number of producers vying for a share of the market will have more than tripled over 1953.

In meeting the challenge of this competitive situation, the majority of manufacturers today are counting heavily upon innovation in product design and operation to overcome consumer caution. Thus, the two new room coolers described here were designed from the very outset to take full advantage of the consumer appeal of reinforced plastics . . . and their success is going to have an important effect on the future plans of the entire air-conditioner industry.

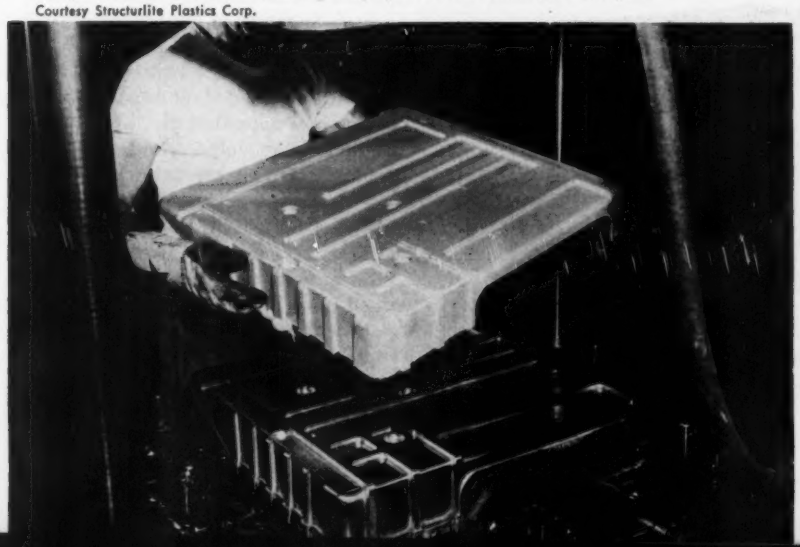
Merchandising Plans

The two new air-conditioning units are being marketed by Muntz Industries, Inc., Evanston, Ill., and by U. S. Air Conditioning Corp., Minneapolis, Minn. The latter unit incorporates the large number of reinforced plastics parts. In addition to the interior and exterior cabinets, these parts include a ribbed base pan which collects the condensate removed from the air; a protective housing for a fan located to the rear of the unit; a one-piece partition doubling as separation for the two halves of the unit and as a housing for the centrifugal blower; and a pair of window wings which fill in the space left on each side of the unit after it is installed in a window.

The number and variety of reinforced plastics parts in the U. S. Air model serve as the keynote for much of the company's current promotion and advertising campaign. Once reinforced plastics had been selected as the construction material for the new model, it was decided to base a major share of the company's aggressive merchandising campaign in 1954 on the consumer benefits derived from using polyester resin-fibrous glass laminates.

To prevent corrosion in base pan where liquid condensate collects in air conditioner, the pan is also molded of fibrous glass-polyester resin laminate in one piece

Courtesy Structurlite Plastics Corp.



Light but Durable

The reasons why the manufacturer chose reinforced plastics are many. According to the engineers and designers who worked on the project, however, they can be summed up in six basic categories.

1) *Light weight*—Because reinforced plastics parts weigh only ⅓ as much as comparable steel parts, the new air conditioner costs less to ship and is easier to install.

2) *Acoustical and insulating properties*—by housing the slinger fan and the centrifugal blower in parts molded of reinforced plastics, noise has been considerably reduced. At the same time, the excellent insulating properties of the laminate eliminated the need for all the extra

insulation required in a metal cabinet.

3) *Resistance to corrosion*—Perhaps the biggest difference between the reinforced plastics and the metal cabinets lies in the resistance of each to corrosion and weathering. Steel exterior cabinets, on the one hand, that are continuously exposed to the elements, are subject to severe rusting which not only shortens the life of the equipment but also produces unsightly discoloration of the exterior building wall. The reinforced plastics cabinets, in contrast, cannot rust and are unaffected by severe corrosive atmospheric conditions.

Similarly, in the mechanical operation of the air conditioner, the use of reinforced plastics for the fan housing and for the base pan serves as an effective safeguard against corrosion. Condensate collects in the base pan when the unit is in operation and various methods have been tried in the past to prevent corrosion in this area. With the introduction of the plastics laminate base pan, the entire problem was solved simply and effectively.

Functional yet Attractive

4) *Functional engineering*—In each of the three sizes in which the U. S. Air model is available (½, ¾, and 1 ton) it is the reinforced plastics construction, inside and out, that makes possible many of the dramatic innovations in the design of the unit.

The lightweight interior cabinet extends less than 2 in. into most rooms. Like the exterior cabinet it is extremely tough and will not chip, dent, warp, crack, or splinter. The inside cabinet is hinged at the bottom so that it can be swung open a distance of several inches at the top to allow access to the concealed push-button control panel.

From the standpoint of the manufacturer, molding the reinforced plastics parts in one piece has resulted in many economies derived from a reduction in the number of parts previously required and the consequent savings in fabrication time.

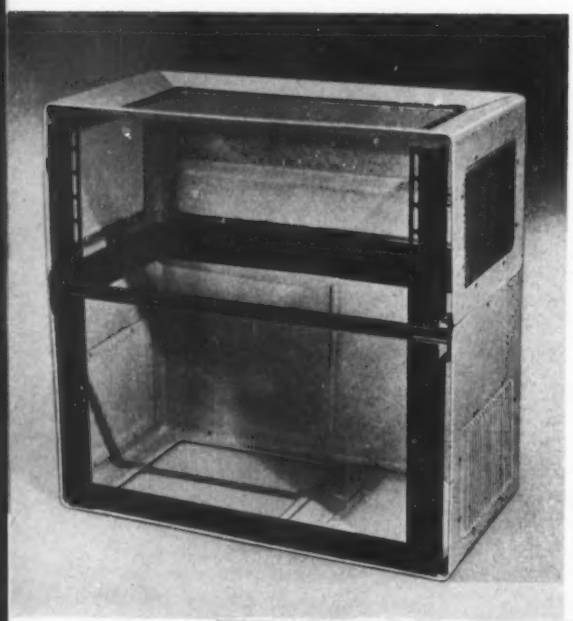
In the exterior cabinet, for example, a groove for the window sash is molded directly into the top of the part. In producing the base pan, several projections, molded-into the bottom of the pan, will eventually serve as condenser air inlet holes. Providing these holes in the base pan eliminates the necessity for air openings in the outside cabinet and simplifies the molding of that part. Finally, flanges designed to support a sponge rubber window seal are molded into the top edges of the window wings.

One-piece reinforced plastics moldings also contribute to the efficient operation of the air conditioner. Molding the complete fan housing—which includes the over-hanging protective shroud, the circular opening into which the fan fits, and the sump which collects the condensate from the base pan—in one piece results in more efficient performance and provides a high degree of acoustical insulation.

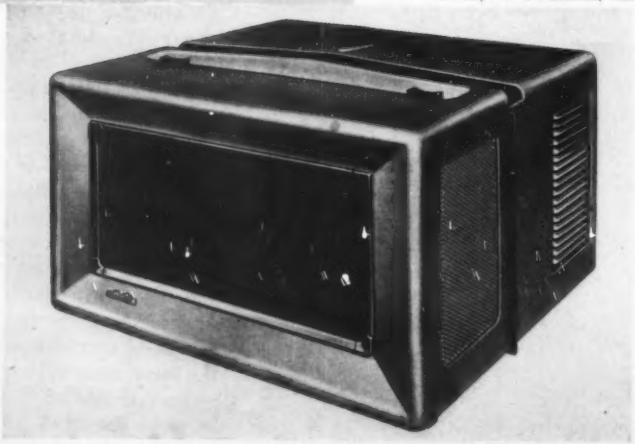
5) *Attractiveness*—The entire cabinet, both interior and exterior halves, is produced in a light neutral beige color that blends well with most interior decoration schemes. Instead of trying to hide the fibers, the designer of the unit has accentuated them to create a decorative fibrous pattern. No additional finishing is required for any of the parts once they have been molded, and maintenance is simply a matter of wiping clean with a damp cloth.

In designing an exterior cabinet of reinforced plastics, the first step has been made in beautifying a part long neglected by the designer. Since today's trends call for more and more of the unit to be pushed out of the window in favor of shorter interior cabinets, the design-conscious housewife is beginning to de-

(*Continued on p. 191*)

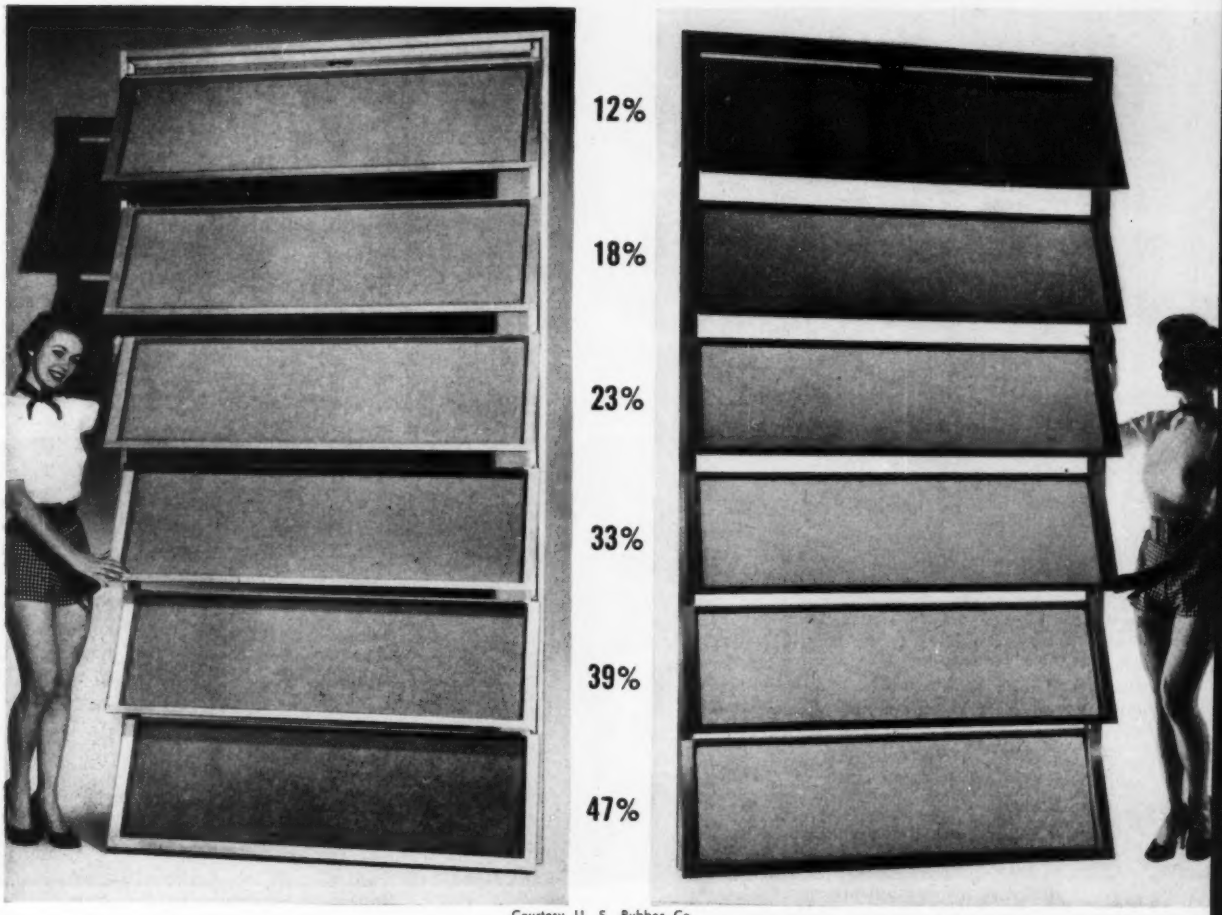


Reinforced plastics interior and exterior cabinets of another air conditioner (bottom view, left) are assembled on a steel structural frame into a single, durable housing



Metallic grilles are fitted into openings molded in sides, top, and front of unit. Control knobs are installed in molded-in cavity on top of interior cabinet

Courtesy Muntz Industries, Inc.



Courtesy U. S. Rubber Co.

In reflected light, series of plastics glazing panels, each of the same thickness, has virtually the same shade of color throughout (left). Same set of panels, however, when transmitting light, passes different amounts of illumination, as indicated (right)

Light Control in Plastics Glazing

A NEW series of laminated polyester-fibrous glass glazing panels —each identical in color but ranging in light transmission values from as little as 5 to nearly 60%—can be effectively used for dramatic and practical light control.

The panels, called Gradation Tropiglas, in combining closely controlled translucency with the ruggedness of reinforced plastics, open new creative avenues for architects, builders, and decorators. When viewed in reflected light, each of the panels in a color series has virtually the same pastel shade. When transmitting light, the amount of diffused colored illumination that passes through them, however, is controlled quite accurately by selecting panels with the desired degree of translucency.

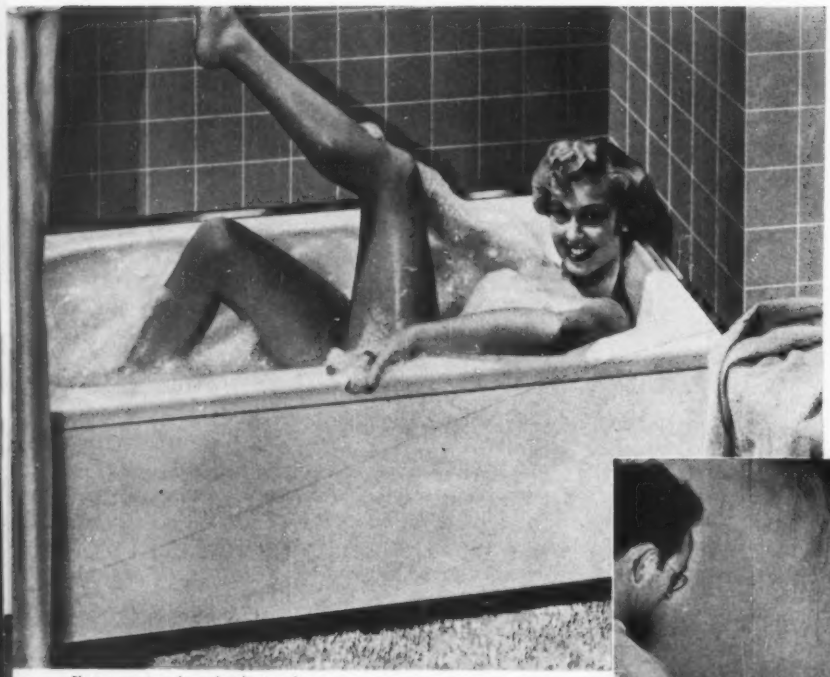
In each of the five color series being produced—white, yellow, green, coral, and blue—a correlated range of translucencies is available in various thickness of material. In the $\frac{1}{16}$ in. thick group, there are seven degrees of translucency, running from 5 to 60%; in $\frac{3}{32}$ in. thick sheet, there are six degrees, the maximum of which is 52% and in $\frac{1}{8}$ in. thick sheet, four degrees are available, running up to 40 percent. Each of the five colors is the basis for a gradation system wherein translucency is not based on thickness but is controlled during manufacture. Grade three, for example, in the same color, has the same percentage of translucency in all thicknesses.

The panels, which are available in 4- by 8-ft. and 4- by 9-ft. sizes, can be glazed easily. They are strong, rotproof, easy to clean, and will stand up satisfactorily under severe weather conditions.

Initial application for the new panels has been in glazing aluminum frame windows, but they are equally useful as patio roofs, car ports, partitions, screens, and a host of other functional as well as decorative applications.

CREDITS: Gradation Tropiglas panels are made by Russell Reinforced Plastics Corp., Lindenhurst, L. I., using Vibrin polyester resin produced by Naugatuck Chemical Div., U. S. Rubber Co., and fibrous glass supplied by Ferro Corp.

Bag



Photos courtesy Lunn Laminates, Inc.

Strong and durable bathtub, bag-molded of reinforced plastics, is lightweight, has permanently lustrous surfaces

FOR the first time in the history of the reinforced plastics industry, vacuum bag molding has become a quantity production process.

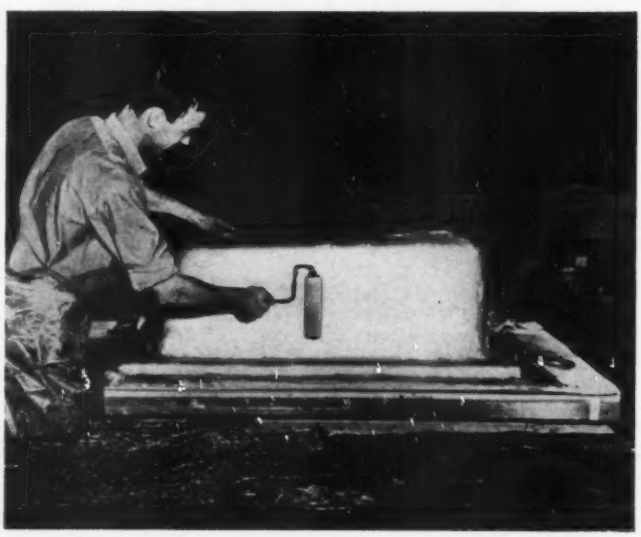
Reinforced plastics bathtubs are being used in increasingly large numbers in mobile homes where space and weight are critical factors to consider.

One of the pioneers[1] in this field, The Carl A. Strand Co., Birmingham, Mich., recently turned the manufacturing proposition over to Lunn Laminates, Inc., which is now turning out the tubs on a continuous production line.

Prime considerations for the tubs' popularity are: structural strength offered by fibrous glass-polyester resin materials, which play an important part where durability is needed, and lightweight features, which make transportation easier and less costly. Other advantages include less breakage in transit, better styling, non-rusting, "warmer" touch, and lustrous surface.

After considering several methods of making the tubs, Lunn decided that bag molding would be the most

1 **After bathtub mold has been cleaned and spray-coated with a parting agent, several layers of resins are successively sprayed over it and cured**



4 **To complete lay-up, several thicknesses of reinforcing mat are placed in position on mold; resins are applied by roller between layers**

* Vice president, Lunn Laminates Inc., Huntington Station, N. Y.

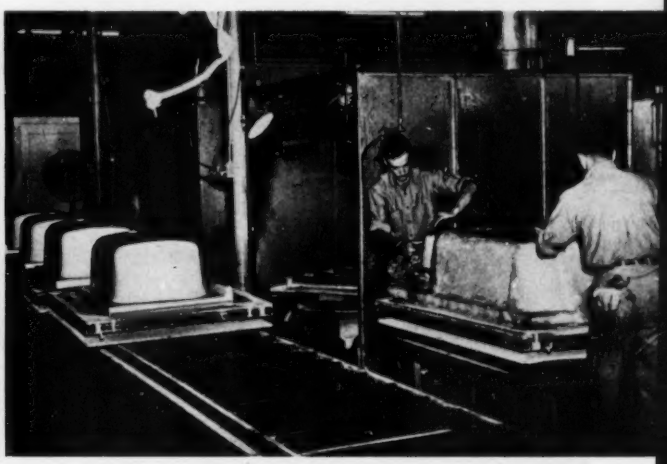
[1] See "Bathtubs of Reinforced Plastics," MODERN PLASTICS 30, 96 (Feb. 1953).

Molded Bathtubs

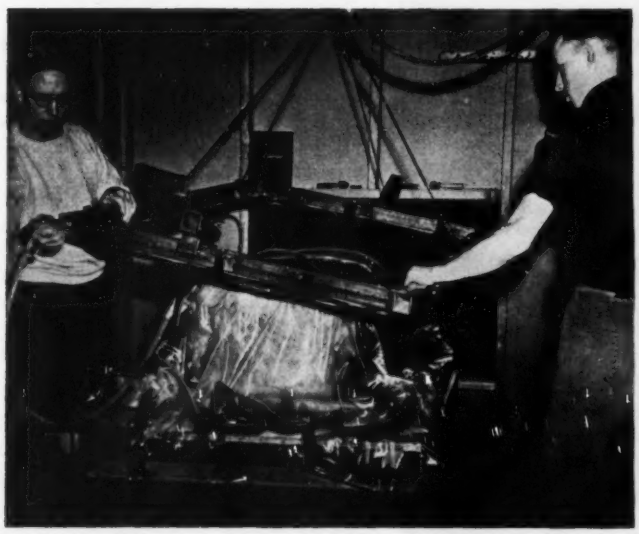
Process permits adequate production speed, uses relatively inexpensive molds, produces good surface finish

by **H. T. Douglas***

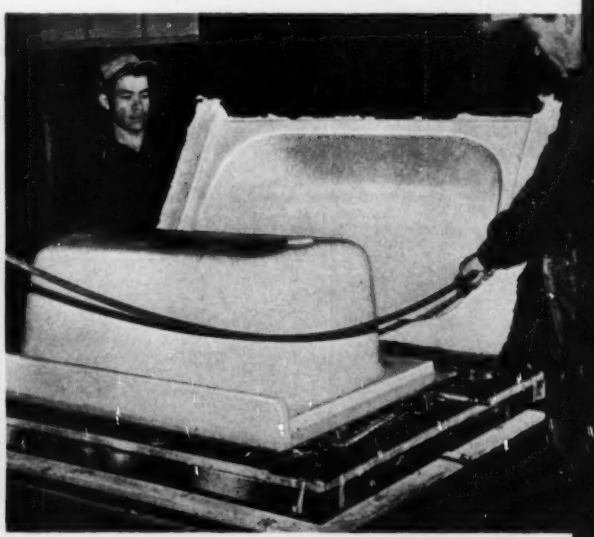
2 Lay-up of reinforcing mat, tailored to proper size and pre-impregnated in material-preparation dept., is done by hand



3 Molds coated with parting agent and cured surface resins emerge from oven (left); operators apply first lay-up (right)



5 Polyvinyl alcohol bag is applied to layed-up mold and held in place by clamp-down ring; air between bag and mold is exhausted by pump



6 Molded bathtub, after having undergone oven cure at 150° F. for several minutes, is removed from mold

satisfactory, but that the method would have to be put on a continuous production basis.

As a process of producing reinforced plastics tubs, the bag molding technique is, from the standpoint of production, several times faster than contact molding, but slower than plunger or matched die molding. The molds used in bag molding are more expensive than contact molds but less costly than the matched dies made of metal. The reasons for selecting bag molding are: better surface finish than by plunger molding; molds are comparatively inexpensive; design changes can be effected easily; and production of parts can be initiated almost immediately.

At Lunn, we designed and produced the master molds for the bathtubs. Polyester and phenolic molds are used. Our greatest problem was getting an acceptable mold surface. We selected the above materials for the mold to withstand the strain of repeated runs, to keep operational costs low, and to gain the added advantage of working with dimensionally stable materials.

Naturally, many other problems were encountered and had to be solved before production could get underway. One of the most important of these involved the necessary parting agent which would facilitate final release of the tub from the mold. Extensive experimental work was carried out until a parting agent was finally developed which fulfilled all of the specific requirements of the bathtub molding job.

Production Steps

Successive steps in the production line manufacture of reinforced plastics bathtubs at Lunn Laminates are as follows:

1) Patterns for lay-up are cut to size in the material-preparation department, where some impregnating of lay-up with resins is done.

2) The bathtub mold is carefully cleaned off with a cloth and the parting agent sprayed on.

3) Several additional applications of sprayed resins are made over the parting agent, each application involving a curing and cooling period, using three ovens and chain conveyor belts to take the sprayed molds through the ovens, with fans to cool the molds upon leaving each oven.

4) Lay-up of reinforcing mat is done manually. Several thicknesses of mat are placed in position on the mold and the resins are applied by rollers between lay-ups.

5) A dry "bleeder" mat is placed over the whole lay-up, making it easier to get the air out—a special technique developed by Lunn whereby the "bleeder" material serves as a porous and absorbent path which carries the air to the vacuum outlet in the bag and absorbs any extraneous resins flowing from the laminate.

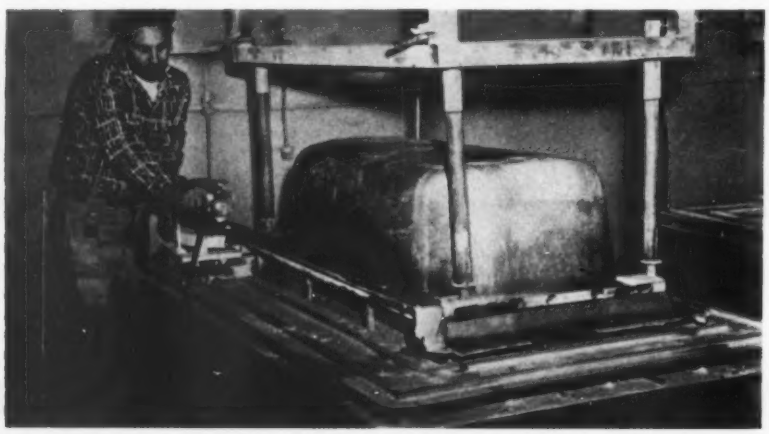
6) A tailored flexible polyvinyl alcohol bag is next applied and held in place by a clamp-down ring, which automatically furnishes a perfect seal, eliminating air pockets and bridges. The air is then exhausted by pump from between the flexible bag and the mold.

7) Curing of the lay-up is carried out at 150° F. for several minutes on a conveyor is an oven.

8) After cure, the tub is transported by conveyor belt to a trim section where the drain hole is drilled and flash sawed or sheared off.

9) Inspection of the tubs to strict quality control standards for abrasion resistance, impact strength, color uniformity, and reaction to hot water and detergents, completes the production process.

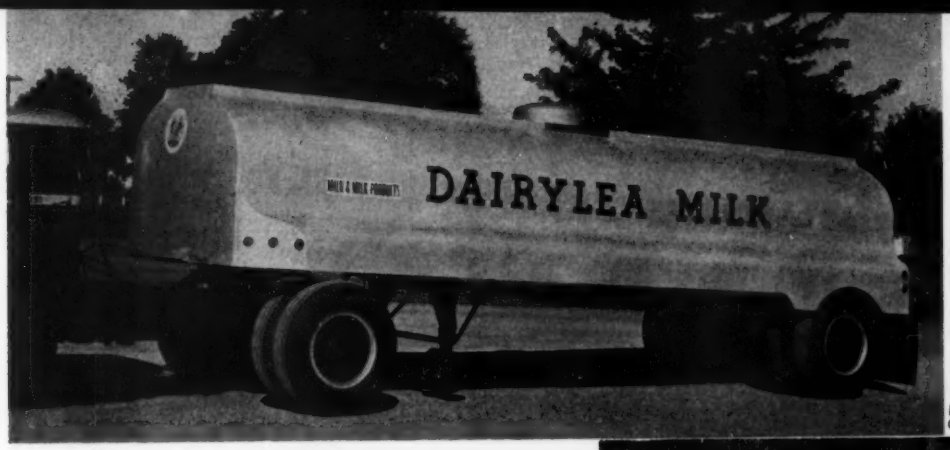
Because of the special resin prespraying on the mold, a satin-smooth finish is imparted integrally to the tub, eliminating need of any final coating. This surface will not chip or peel. The reinforced plastics tubs are made in two home sizes, 46½ by 27 by 14 in., and 54 by 27 by 14 inches.



7 Special jig is used to locate molded bathtub properly for trimming rolled-over edges; other edges of tub will be sheared off in a later finishing operation

8 Final step in production of bag-molded reinforced plastics bathtub is careful inspection of finished molding for quality, strength, color, and chemical resistance

CREDITS: Gel-Kote polyester spray surfacing by The Glidden Co., Chemical & Pigment Div., Cleveland, Ohio; Owens-Corning Fiberglas mat is used with polyester resins from Glidden, Reichold Chemicals, Inc., New York, and The Barrett Div. of Allied Chemical & Dye Corp., New York; polyvinyl alcohol bag material from Reynolds Metals Co., New York.



Milk truck tank, with a capacity of 4000 gal., is molded in one piece of fibrous glass-polyester resin laminate. "Sandwich" construction of walls includes 2-in. thick core of balsa for added insulation

Photos courtesy Celanese Corp. of America

"Sandwich" Walls for Milk Tank

Reinforced plastics skins and balsa core provide high strength and thermal insulation

Installation of running gear sub-structure is begun on the plastic tank while it is partly out of wooden mold

GROWING interest of truckers in the possibilities of reinforced plastics tanks has been given added stimulus by the successful application of the "sandwich" design principle to the construction of a molded 4000-gal. capacity milk truck tank.

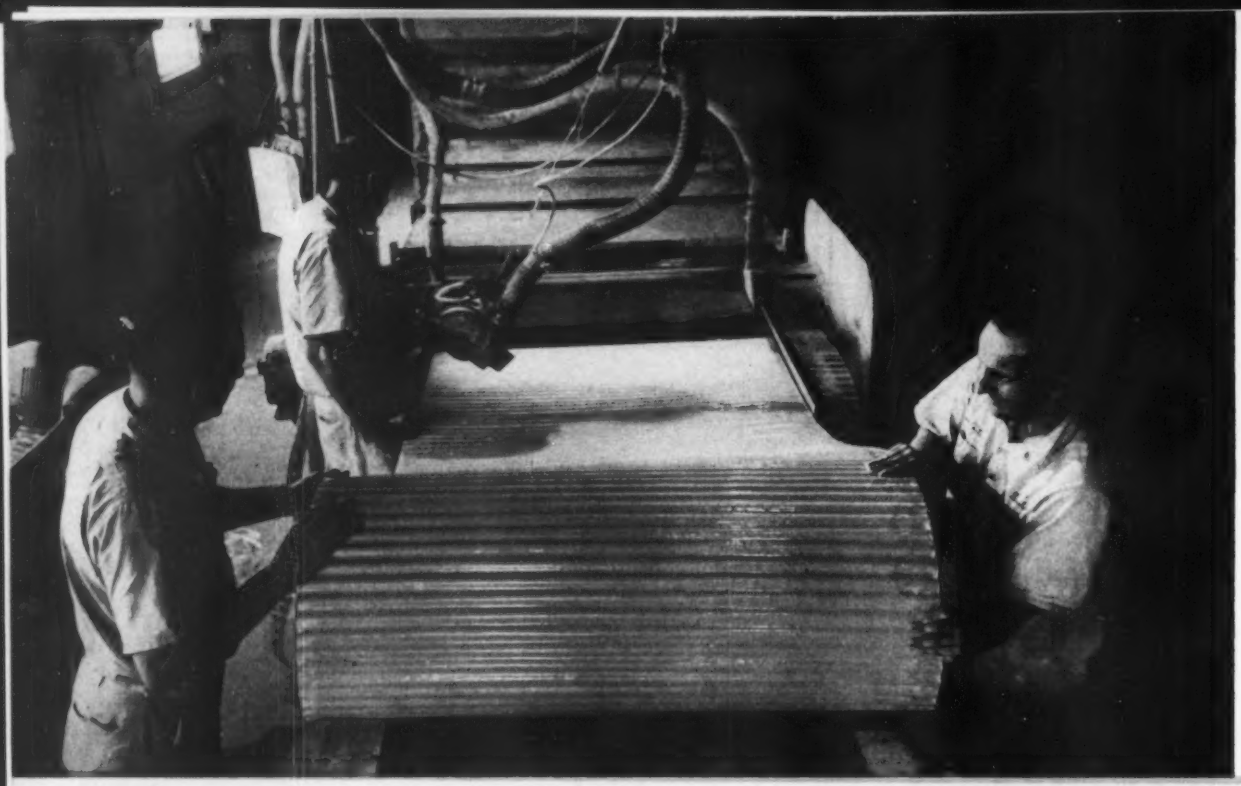
Because of the "sandwich" walls, the new tank has proved far superior in many ways to the conventional insulated steel tanks used for hauling milk. The light weight reinforced plastics shells, which serve as the skin of the "sandwich," are exceptionally strong, will resist weathering, will not dent or rust, are simple and quick to repair, and can easily absorb the constant shocks and stresses to which an over-the-road vehicle is subjected while traveling millions of miles in all parts of the country. The 2 in. thick sheet of balsa wood, which is the core of the "sandwich," combines with the plastic to provide excellent thermal insulation—at least twice as good as that of any standard tank trailer on the road today.

The entire tank, including a skirt to prevent the rear wheels from splattering mud and dirt on the sides of the trailer, is molded in one piece. Since the complete tank measures about 27 ft. long and 58 in. high, and has a circumference of 18 ft., it is claimed to be the largest one-piece molding yet produced for an application of this type.

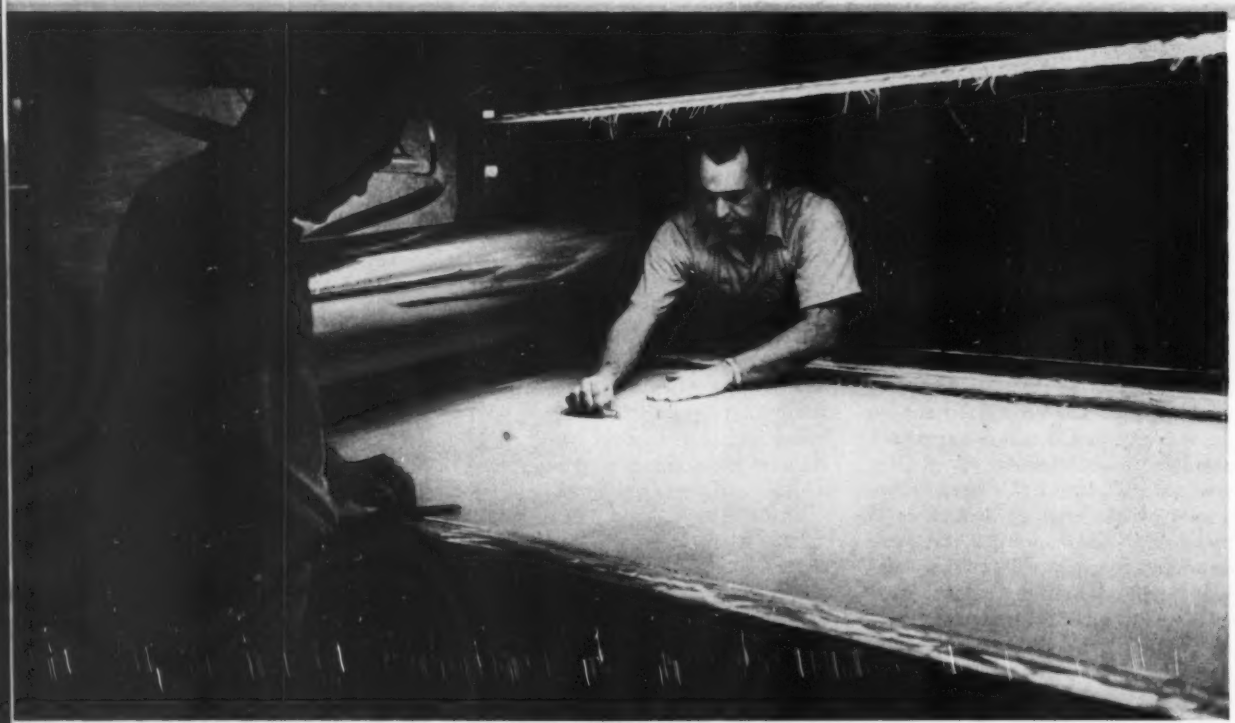
In addition to the fibrous glass cloth and mat and the balsa wood core, the lay-up for the tank includes a thin stainless-steel lining to meet sanitary requirements governing the transportation of milk. A dry lay-up method is used, the polyester resins being introduced into the lay-up. After a short curing period, the tank is lifted from the wooden mold complete, including a silvery

(*Continued on p.* 190)

Tank emerges complete, including silvery finish, from the mold



REINFORCED PLASTICS



Photos courtesy American Cyanamid Co.

Produced in continuous lengths limited only by length of glass mat, fibrous glass reinforced plastics corrugated structural sheeting is rolled into ready-to-pack form after emerging from curing oven (top photo); when specified length has been rolled up, sheeting is cut by saw. In bottom photo, operators spread color on and smooth out impregnated flat mat as it travels to oven for heat and pressure cure. Mat is sandwiched between protective cellophane sheets which will remain in place until reinforced plastics sheeting is installed

BY-THE-YARD

Glass mat, drawn from rolls, is impregnated with polyester resin and cured in a continuous process to form long lengths of translucent structural paneling

A TOUGH, translucent, and durable building material has now entered the by-the-yard market. It is a colorful fibrous glass-reinforced structural sheeting made by a continuous process in which a roll of glass mat is impregnated with light-stabilized polyester resin and color paste, and rapidly cured. The machine which makes this process possible can produce a sheet—corrugated or flat, rippled or smooth, opaque or translucent—as long as 150 ft., or the maximum mat length obtainable from mat manufacturers. Width may be from 1 to 5 feet.

In general, the corrugated sheets are primarily for exterior use—porch roofing, skylighting, awnings—while the flat sheets are popular for such applications as shower enclosures and green-house glazing. For most commercial and home applications, the translucent panels are in greatest demand; opaque colors find widest use as outdoor sign backing and store fronts because they emphasize the lettering or illustration.

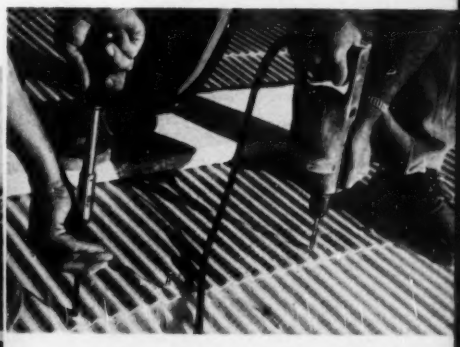
Advantages

This new material, called Spun-Lite, has impact strength exceeding most code requirements, yet is flexible enough to be made into rolls. Even the corrugated sheets can be rolled because the corrugations traverse the width of the sheet. According to Paul Hoffman, vice president of the producing company and developer of the machine which makes the process possible, plans are underway for making sheets up to 12 ft. in width. Thus, a single sheet of the material could cover a terrace 12 ft. wide and, conceivably, 150 ft. long.

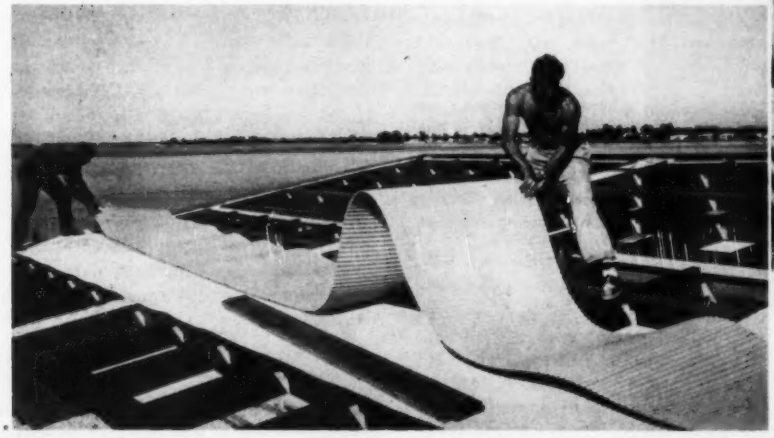
This continuous reinforced-plastics sheeting offers several advantages in handling, shipping, and actual use. The material's flexibility permits the sheets to be rolled and inserted in easy-to-handle cardboard cartons. A wooden crate, which would add to bulk, weight, and transportation cost, is not needed. One carton, only 25 in. by 3 ft., will hold a sheet 2 ft. wide, and 100 ft. long—or 200 sq. ft. of material. To ship a similar footage of individual, flat panels would greatly increase the weight and size of the shipping container. Cartons are made to hold all standard widths of the reinforced-plastics paneling.

Installation of the material is simplified, too, because there are fewer joints to make. In a roof or a wall, the fewer the number of joints the less chance there is for leakage or

At time of installation, sheeting is easily cut to desired lengths . . .



. . . it can be drilled and fastened in the same manner as sheet metal . . .



. . . and, coming in continuous lengths, necessitates fewer overlap joints

Roof made of continuous lengths of reinforced plastics sheeting has few joints—thus less chance of leaking; construction is economical because exact footage can be purchased

Cardboard cartons, economical and easy to handle, give ample protection to rolls of continuous reinforced plastics sheeting material during shipment

admission of wind-blown rain. What the builder or home owner will probably like best is the fact that he need buy only what is exactly necessary to complete his project. Advance planning tells him just how much he needs. He can have it precut or can easily cut it to size on the job.

A recent development in this material is a rich, dull finish which provides better light diffusion than the standard glossy material and which is especially suited to interior partitions, skylights, and awnings. The sheeting can be made in any color and with a finish ranging from dull to glossy.

Since the development of the continuous production machine, this new material has found wide use. In the sign field, for example, the Coca Cola Co. is reportedly using it as a backing for outdoor display signs. The signs are easy to make. Sheets of the reinforced plastics are merely slipped into a metal frame, the letters, cut from corrugated sheets of contrasting color, are applied with adhesive or metal clips, and the sign is ready to use.

Production

Essentially, the continuous production process is as follows: A roll of glass mat, mounted on an overhead platform, unwinds slowly and passes against a roller which applies the colored polyester resin. The resin well which coats the roller is fed by gravity from tanks also mounted on the overhead platform.

As the resin-impregnated mat leaves the roller, it moves between two continuous sheets of clear cellophane coming from two other rollers. These sheets control the finish and hold the resin in the mat as it is subjected to heat and pressure in the curing oven. They are left on to keep the sheets clean until ready to use, then are peeled off. As the material emerges from the oven in which the permanent shape and finish of the sheet are set, it is automatically trimmed to the desired width. A fluorescent light under the material permits easy inspection. A special power shear is used to trim the ends or to cut special custom-order lengths.

CREDITS: Spun-Lite is made by Spun-Lite Corp., Miami, Fla. The polyester is Laminac from American Cyanamid Co., New York, N. Y.

NEWS AND VIEWS OF PLASTICS PROGRESS

STOKES *plastics review*

VOL. 3
NO. 1
1954

PUBLISHED BY F. J. STOKES MACHINE COMPANY, PHILADELPHIA 20, PA.

TOASTER BASES RE-DESIGNED TO BE MADE AT LOWER COST BY FULLY AUTOMATIC MOLDING

The source of this before-and-after epic is re-design of a General Electric toaster base, formerly made as a large base, plus two end strips as shown. The base was made on a Stokes 200-ton straight-ram semi-automatic molding press. With preheater and preformer the operation took one man's full time. Nevertheless, the product was fully satisfactory and the operation was considered economic.

BEFORE: Earlier General Electric Toaster base consists of large frame requiring semi-automatic molding and separate end pieces.

AFTER: New design consists of two end pieces only, attached to central chassis member. Style is improved cost reduced.

Battery of 50-ton Stokes fully automatic molding presses in the General Electric plant at Allentown, Pa., used for molding a wide variety of plastic parts.

A style change offered the opportunity to re-design these parts. General Electric designers and production men, already familiar with the many advantages of automatic molding, seized the opportunity to tailor the design of the new toaster base to permit automatic molding of the parts. Far less material is required, the toaster is improved in appearance, the separate base is eliminated, and the whole job is now done on two Stokes 50-ton fully automatic molding presses. These require only one-fifth of a man's time to operate, as he has only to fill the hopper with powder and remove finished parts from time to time. Production is the same as when the man's full time was required; labor cost per unit for each toaster is obviously only one-fifth as much.

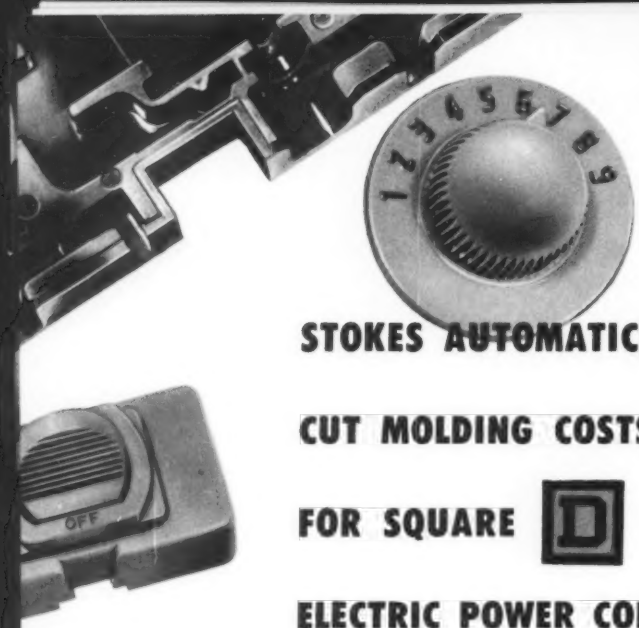
WARM THOUGHTS FOR COLD MONTHS

Closeup view of control case and switch cover for electric blankets and electric heating pads made on Stokes fully automatic presses at Northern Electric Co.

Northern Electric Co., Chicago, Ill., works on heating pads and blankets the year around . . . in August as well as February . . . because it's a year 'round production job to make both complete units and parts for electric heating pads and electric blankets to keep the rest of us warm in the frigid season.

Switch bases and covers in three different colors, and blanket control cases in six different colors are produced on four Stokes fully automatic plastics molding presses at Northern Electric Co. These presses, which are in operation 24 hours a day, six days a week, have provided consistent service during the past two years. The case for the control mechanism is produced in a two-cavity mold running on a $1\frac{1}{4}$-minute cycle.

After set-up is complete, the Stokes presses operate without attention, except for periodic filling of the hoppers. The entire molding operation is automatically controlled, and if any press function is not correctly completed the machine is stopped. Parts are collected at the machine in bulk and removed for tumbling. The feed can be accurately and conveniently adjusted at will. The unit is completely self-contained, requiring only air and electric power connections.



STOKES AUTOMATICS CUT MOLDING COSTS FOR SQUARE D ELECTRIC POWER CONTROL

Five of seven Stokes fully automatic molding presses in operation at the Los Angeles plant of the Square D Company. Model 741 is at right, two Model 800 presses in rear, and two Model 200-D3's at left.

The Los Angeles plant of Square D Company offers a singularly good example of an in-plant molding operation guided by an acute understanding of how to use fully automatic molding to achieve high production of quality parts with minimum man-hours of labor.

Adjacent pictures show the intricacy of electrical parts produced in the Square D plant to meet exacting precision standards. These parts, assembled with other components, stand up for hundreds of thousands of cycles of service. Such parts are made automatically on Stokes presses in 1-, 3-, and 8-cavity molds at 18 to 20 cycles per hour.

The presses used are fully automatic Stokes Models 800, 741, and 200-D3. The 741 is a 50-ton press; the others of 15-ton capacity. Seven of these presses make up the present battery at the Square D plant, and about a dozen different parts are produced. All presses are fully automatic, requiring only spot-checking of parts and the occasional services of an operator to load the hopper with molding powder and remove the finished parts.

Operator removes 24 molded switch bases from 200-ton Stokes Model 727 transfer press. This press is used for making a hundred or more products at the Georgetown, Ontario plant of Smith & Stone Limited.

PLASTICS PRODUCTION NORTH OF THE BORDER

Prominent among Canadian users of Stokes equipment is Smith & Stone Limited. This huge concern has recently completed a new plastics plant at Georgetown, Ontario, a few miles northwest of the home office at Toronto.

Smith & Stone Limited make a most complete line of wiring devices. They operate a Special Products Division for the engineering and production of electronic and other complex equipment. With the addition of their new plant Smith & Stone Limited boast a remarkably versatile plastics production program embracing many forms of extrusion, compression and injection molding, aluminizing, low pressure lamination, fabrication and silicones. Products are distributed throughout the entire Dominion.

Among many Smith & Stone products made on the Stokes Model 727 transfer press are distributor caps, household items and appliance parts, toaster bases and clock parts. The Stokes press has been found exceptionally valuable for making parts of heavy section. Controlled three-speed closing adapts the press to pieces with projections and small pins, and keeps breakage at a minimum. The patented Stokes Bar Controller, which is infinitely adjustable for various molding cycle requirements, has a particular value for a manufacturer making many different products because the setting for every step of any cycle can be recorded, and immediately duplicated when the same part is to be run again. This press can be converted to compression molding by a simple adjustment of the bar controller.

Smith & Stone Limited and its associated companies make their headquarters in uptown Toronto in a building which was designed and built for their use. All beauty outside, all modern efficiency inside, this handsome air-conditioned Georgian building is an ornament to Canada's growing business empire.

VACUUM METALLIZING BOOSTS SALES OF PLASTIC MUSICAL INSTRUMENTS

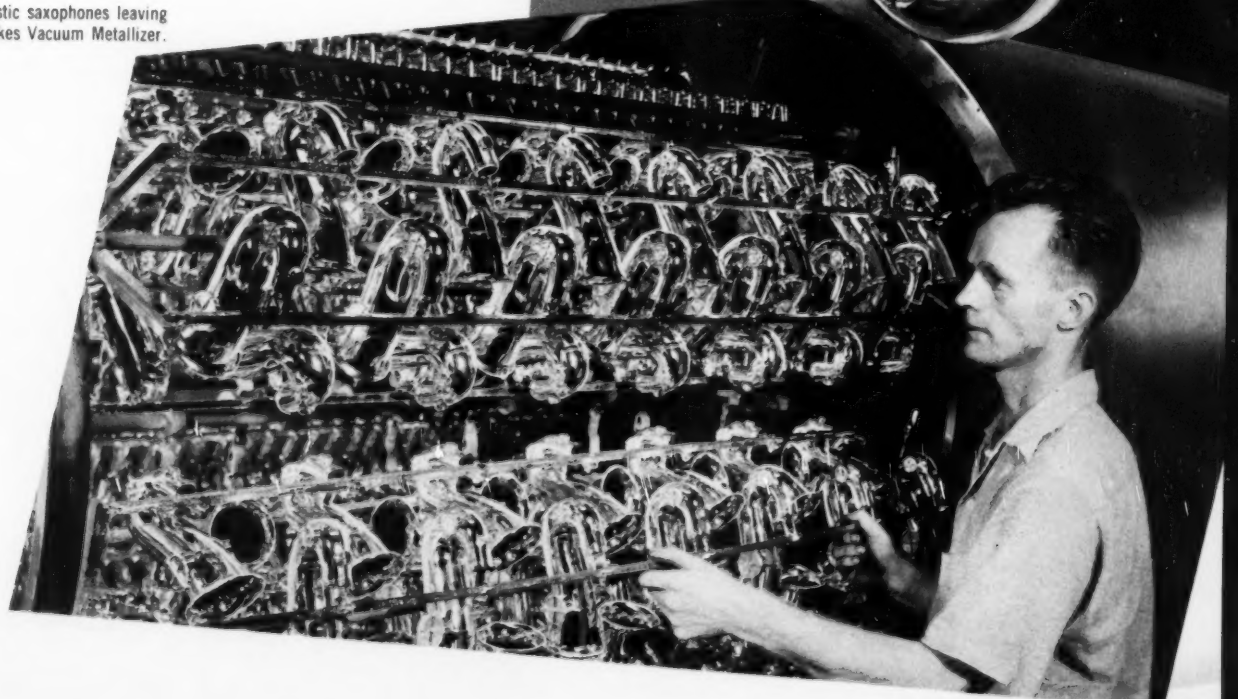
They're toys, but they make music! They're plastic, too; light, resistant to breakage, low in cost to manufacture, high in sales appeal. Vacuum metallizing gives them the brassy shine that permits Junior the indulgence of thinking he is a one-man brass band.

Harmonic Reed Corporation, Rosemont, Pa., formerly made saxophones of polystyrene with color added to simulate a brassy yellow. When vacuum metallizing was found to be practical the switch was made to the new method of finishing and the demand for plastic musical instruments boomed. Harmonic Reed then added a trumpet and a junior-size saxophone to the line, which includes plastic base harmonicas widely distributed throughout the world.

Harmonic Reed makes the bodies of toy instruments of high-impact material which gives them great resistance to shock. The molded pieces are then lacquered, and metallized 200 at a time in a Stokes 48-inch Vacuum Metallizer. Metallizing is done with aluminum which gives a brilliant metallic shine; the effect of brass is achieved by dyeing a top-coat of lacquer with yellow. This coat also serves as a protection for the thin coat of metal which is used. Drying of the top-coat of lacquer is done at 140° F. Metallizing of these toys is done on a 25-minute cycle. Because the metal film deposited under vacuum is completely opaque, it is often possible to use scrap plastic.

Complete laboratory and pilot plant facilities are available at the Stokes plant for evaluation of the vacuum metallizing process to samples which manufacturers wish to submit.

Before and after metallizing plastic saxophones at Harmonic Reed Corporation, Rosemont, Pa.



Plastic saxophones leaving Stokes Vacuum Metallizer.

STOKES

Newly re-designed Stokes-Windsor RC-100 Extruder. Note hinged adapter plate; also swing-away barrel clamps. The extruder is producing 2-inch rigid PVC pipe in the Stokes Laboratory at Philadelphia.

STOKES-WINDSOR EXTRUDERS A FACTOR IN PLASTIC PIPE INDUSTRY'S 60-FOLD GROWTH

Many leading extruders of pipe and other products are investing in Stokes-Windsor Extruders as a means of capitalizing on the big prospects in plastic pipe and other extruded plastic products. As to plastic pipe alone the closest estimate is that 1953 sales totalled around $15,000,000. This is a single branch of the extruded plastics business, which in 1948 had sales of only about $500,000. By 1957 it is estimated that plastic pipe sales will reach or exceed $250,000,000 annually!

Extruded polyethylene plastic pipe offers compelling advantages over copper or galvanized pipe for many purposes. It has superior resistance to corrosion and chemical attack, and, of course, it does not rust nor suffer electrolytic attack. It is much lighter and more flexible than metal pipe. Inner walls are so smooth that hydraulic friction is very low; less power is required to pump fluids. Fewer fittings are required; installation and servicing are less expensive. And it is cheaper than copper; cheaper even than galvanized pipe in most parts of the country.

Pipe is but one of the plastic extruded products which are expanding the businesses of many manufacturers. Other Stokes-Windsor users are making rod, tape, elastomeric sheet, garden hose, shoe welting and other sections which, like pipe, are enjoying rapidly increasing sales.

A Stokes-Windsor RC-100 Extruder is available in the Stokes laboratory for demonstration to manufacturers who wish to evaluate this unique machine for their products.

DO YOU HAVE OUR LATEST LITERATURE?

The Chinese, they say, choose the last day of the year to clean up all bills. Late or early in the year, it's always a good time to throw out your old catalogs and make sure you have the most up-to-date editions. The following catalogs and bulletins cover a wide range of Stokes equipment made for the plastics molding industry. Check the enclosed postage-free return card for any you need.

Model 731 Semi-Automatic Toggle-Action Molding Press: an entirely new press with many improvements over the old 250 series which it replaces. Bulletin No. 516.

Model 800 Fully Automatic Press: a high-speed press of 15-ton capacity which molds all thermosetting plastics, including alkyds without press modification. Bulletin No. 513.

Model 726 (Compression) and Model 727 (Transfer) Molding Press: a new edition includes the new 50-ton and 300-ton sizes in addition to the original 100- and 200-ton series. Bulletin No. 520.

Plastics Preforming: new edition of a brochure on preforming with illustrations and specifications of 13 Stokes preform presses for this work. Catalog No. 509.

Vacuum Metallizing Today: an authoritative brochure on this fast-growing method of metallic finishing for use on plastics, metal, glass and other materials. Catalog No. 725.

Plastics Extrusion: a descriptive folder on the Stokes-Windsor RC-100 Twin Screw Extruder for making of plastic pipe, sheet, tape and other sections. Bulletin No. 550.

Plastics Molding Presses: a comprehensive catalog of Stokes equipment for plastics molding. Catalog No. 525.

STOKES

F. J. STOKES MACHINE COMPANY
5534 TABOR ROAD, PHILADELPHIA 20, PA.

STOKES MAKES: High Vacuum Equipment, Vacuum Pumps and Gages / Industrial Tabletting, Powder Metal and Plastics Molding Presses / Pharmaceutical Equipment

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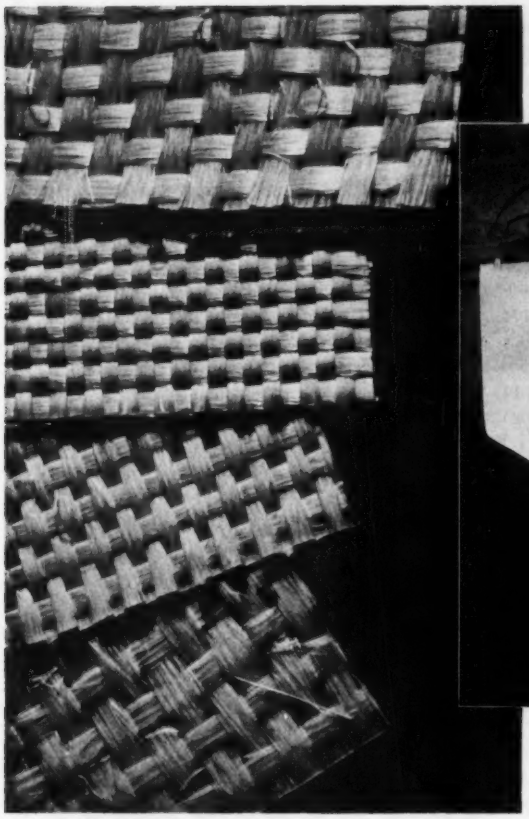
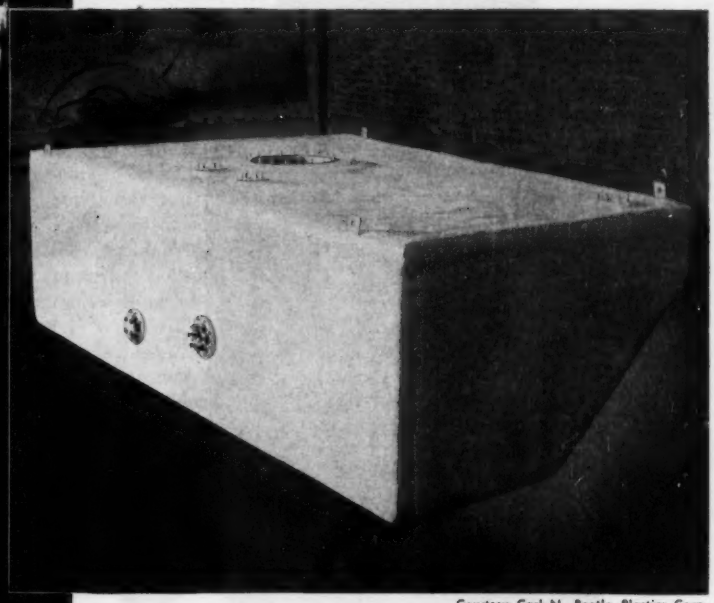


For use in plastics reinforcement, material woven of untwisted glass roving permits better penetration of impregnating resins



Courtesy Carl N. Beetle Plastics Corp.

Ship tank with capacity of 1700 gal. was made of reinforced plastics using woven glass roving in a hand lay-up process. Corners are strengthened by added layers of reinforcement

Woven Glass Roving

New plastics reinforcement offers high strength and bulk at low cost

TO achieve highest strengths and bulk in plastic reinforcements at a cost fairly close to that of glass mat, a new woven glass roving product has been introduced.

Known as Glastrand, the new material is made up of standard untwisted glass rovings, rather than the conventional twisted and plied continuous filament glass yarns. Virtually no twist is put into the roving when woven into fabric, thereby allowing better penetration of impregnating resins.

Standard constructions which have been developed to date range in weight from 13 oz. per sq. yd. to as high as 52 oz. per sq. yd., and experimental weaves, as heavy as 71 oz. per sq. yd., have been developed. Standard weaves are from 0.019 to 0.085 in. in thickness, and experimental weaves have been produced as thick as 0.110 inch. Laminates made in accordance with Federal Specification LP406b have achieved flexural strengths up to 91,750 p.s.i.

These woven constructions have been designed primarily with 60-end glass rovings, although varying weights and thicknesses are achieved with the use of 24-, 30-, and 120-end rovings. The fabric is produced in plain, basket, and satin weaves in a standard width of 54 inches. The rovings are treated with Garan or similar finishes prior to weaving in order to yield the best wet strengths and bonding characteristics in the finished product.

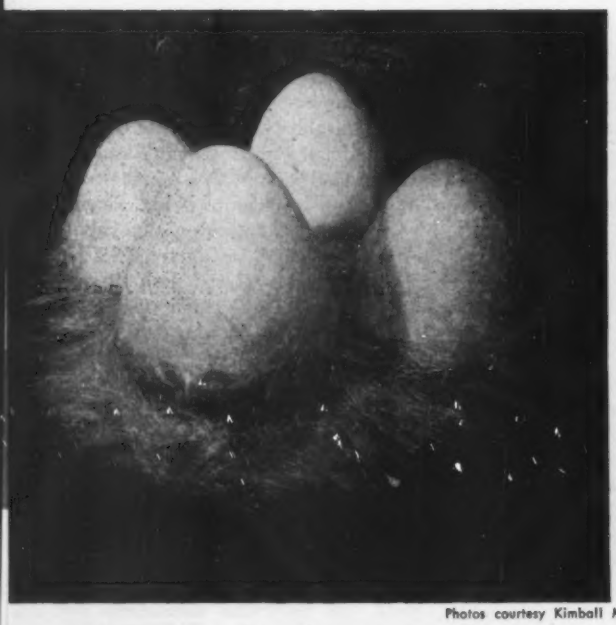
The manufacturers of Glastrand believe that woven glass roving will open many new fields in plastics reinforcements where high strength, bulk, and uniformity of distribution of the glass is required at a lower pound price than other woven reinforcement materials.

Glastrand is presently being tested for reinforcements in aircraft, plastics tanks, boats, trailer trucks, reinforced pipe, electrical panel boards, and guided missiles. One of the first important applications for woven roving is in a ship tank with a capacity of 1700 gal., made by Carl N. Beetle Plastics Corp., Fall River, Mass. The tank was made in sections by hand lay-up in wooden molds with the use of Laminac low pressure resin. The tank is provided with extra strength at all corners by the use of additional layers of reinforcing material to give greater density.

CREDITS: Glastrand was developed by Strandcote Corp., Hawthorne, Calif., which company is producing it for distribution on the West Coast by Thalco Glass Fiber Products, Los Angeles, Calif. The material is to be manufactured and distributed throughout the rest of the U. S. by J. P. Schwebel & Co., Inc., New York, N. Y., at the company's Clifton, N. J. plant.

Fibrous glass-reinforced plastics protective hood is mounted on pump motor by bolts through molded-in bosses

'Safety Hats' for



Photos courtesy Kimball Manufacturing Corp.

Preforms for protective hoods for turbine motors are made in sets of four on 60-in. diam. turntable, using standard glass roving

After cure of resin which bonds finished preforms has been completed, they are carefully inspected prior to final molding operation (right)

Motors

Protective hoods of reinforced plastics replace metal units, with cost savings all along the line

AFTER several years of experience with cast iron, stamped steel, and spun aluminum as materials for protective hoods used for deep well turbine-pump motors, engineers of Westinghouse Motor Div., Sunnyvale, Calif., have switched to reinforced plastics because of certain objectionable characteristics of the metals.

These motors, sold complete with hoods to pump manufacturers, have to take a great deal of abuse from rocks, tractors, careless pipe handling, and the dropping of tools. The metal hoods were subject to breakage, rust, and denting—and they constantly required painting.

So the main purpose in the switch from metal to reinforced plastics was to obtain high impact strength, corrosion resistance, and permanent finish. The fact that lighter weight was also obtained was purely a plus.

The first hood in the series, called "Fiberglas Protective Hood for Vertical Hollow Shaft Motor," mounts on 20-, 25-, or 30-hp. motors and measures 15½ in. in diameter by 11 in. deep with a wall thickness of 0.100 inch. So successful has this unit been during a year of extensive testing under various operating conditions, that Westinghouse has already made plans to use similar hoods on other motor sizes ranging up to 32 in. in diameter.

The component looks like a simple elliptical bowl, but it isn't. It is a very deep draw with a very thin wall and has molded-in bosses or pads for mounting bolts, sections of which are three times the thickness of the body.

Preforming screens were made most carefully, running four-up on the 60-in. diameter turntable of a 25-hp. preformer. The glass used was standard roving 60 ends. Each half of the mold was steel forged in two pieces and then welded, each mold half then being turned on a lathe for final dimensioning and finishing. The dies were provided with hardened cut-offs so that the hoods are finished when removed from the mold, except for hole drilling in the bosses by the motor manufacturer.

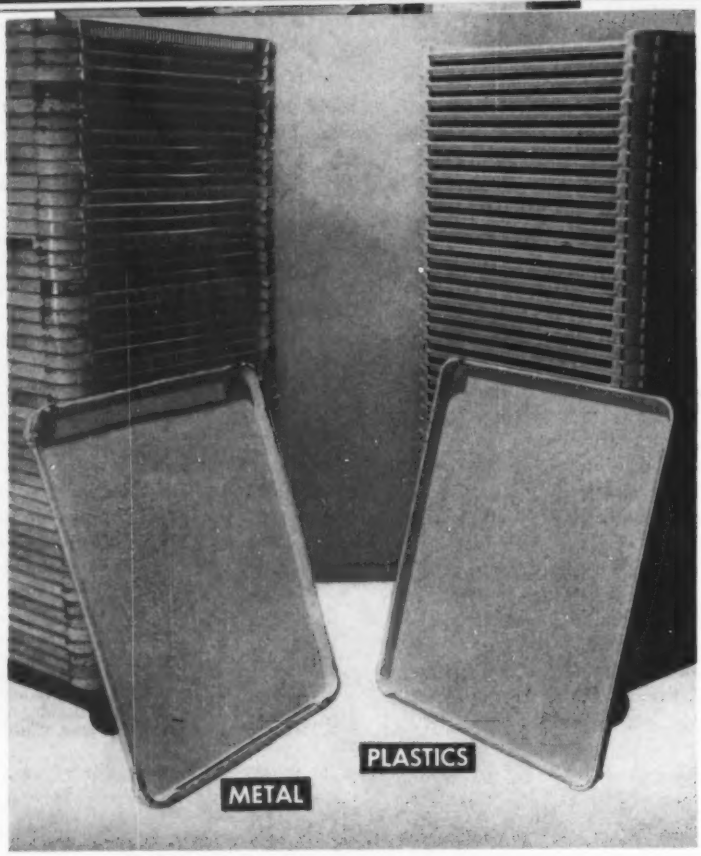
Molding is at 250° F. with a three-speed closing of the press occasioned by the need to mold the bosses without developing resin-rich areas. Cure cycle is 140 seconds.

Initial cost of the first series of hoods is about the same or slightly less than metal hoods of the same sizes, but the savings in freight, in damage on the job, in re-painting are noteworthy. Both customer and dealer good-will are also improved.

CREDITS: Engineering by Westinghouse Motor Div.; glass roving by Owens-Corning Fiberglas Corp., Toledo, Ohio; Selectron polyester resin by Pittsburgh Plate Glass Co., Pittsburgh, Pa.; molding and preforming by Kimball Manufacturing Corp., San Francisco, Calif.

Preform is placed in female half of matched metal molds and resin-impregnated; the forged steel die have hardened cut-offs to eliminate need for post-molding finishing

Completed protective motor hood molding is removed from press. Bosses (one shown) are molded-in



Problems of chipped surface coating and poor air circulation, characteristic of enameled metal drying trays, are overcome by reinforced plastics trays with cut-down edge design

Trays That

REINFORCED PLASTICS drying trays are supplanting metal trays at the modern plant of Gelatin Products Div., R. P. Scherer Corp., Detroit, Mich., which makes a large part of the soft gelatin capsules for such products as vitamin preparations, manufactured in the United States. The use of these sturdy, lightweight trays, which require no periodic refinishing and exhibit other points of superiority over metal trays, is expected to result in faster production schedules and improved service to Gelatin Products customers. A total of approximately 60,000 plastics trays will ultimately be involved in this program.

Using patented, specially developed automatic equipment, Gelatin Products Div. manufactures the capsules and fills them with vitamin preparations, medicinals, veterinary products, and various other types of liquids and semi-solids for a large number of pharmaceutical firms and other manufacturers whose products range from foods, flavors, and cosmetics to adhesives. One part of the rotary die process of producing soft gelatin capsules requires that the capsules be spread on shallow trays and placed in a controlled, air conditioned area for drying. In their original state, the capsules, which are formed from ribbons of gelatin

Photos courtesy Molded Fiberglass Tray Co.

Fibrous glass-polyester drying trays are formed in matched metal molds at a temperature of 245° F. After removal from press (above), trays are ready for edge finishing

Capsules, just filled and still moist, are spread on securely nesting reinforced plastics trays for drying

Speed Production

Reinforced plastics units for drying gelatin capsules do the job faster, eliminate costly maintenance of metal trays

passed through the capsulation machines, are quite soft. The purpose of the controlled drying process is to extract the excess water present in the gelatin, leaving the capsules firm and capable of being handled without damage.

Metal Trays Replaced

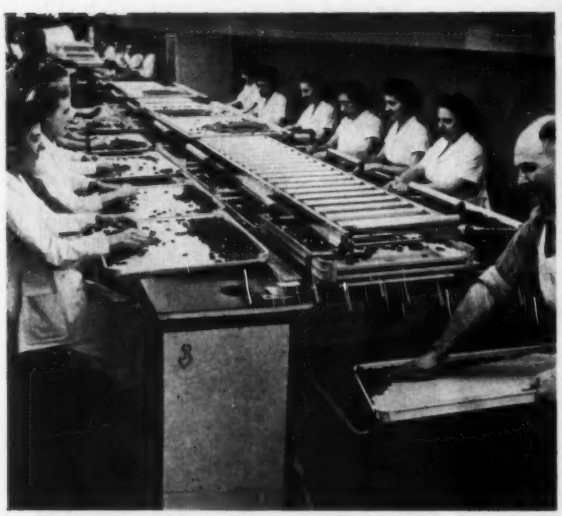
For many years, Gelatin Products Div. used metal trays for this drying operation and the subsequent inspection of the individual capsules. The metal trays, measuring approximately 24 by 32 by 1⅛ in. deep, were designed to be stacked one upon another to a height of about six feet. They were made with a series of slots in each end to facilitate air circulation and drying of the capsules.

In service, the metal trays showed several disadvantages. It was found, for example, that a metal tray designed for ideal air circulation was flimsy and difficult to handle. When such trays became bent or damaged, they did not stack satisfactorily. Also, considerable difficulty was experienced with the special enamel coating applied to each tray to resist the adverse effects of certain ingredients which adhere to the capsules during the manufacturing process. Damage to the enamel coating from this cause and as a result of handling during the inspection procedure necessitated stripping and repainting of the metal trays on an average of once a year. Although the periodic re-enameling process is costly, it is a necessary maintenance project when metal trays are used.

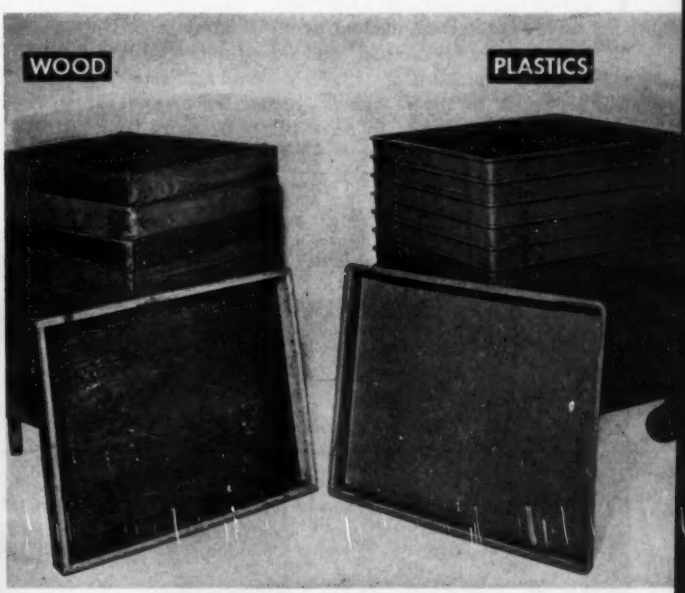
In an effort to avoid the limitations of the metal trays, Gelatin Products Div. conducted considerable research with trays molded of fibrous glass-polyester laminates. Through this activity, an improved design was perfected which afforded much better circulation of air around the capsules, thereby materially reducing the required drying time. Basically, this is accomplished by using a lowered edge on each end of the tray which does not obstruct the passage of air.

The integral white color of the new reinforced plastics trays is entirely unaffected by the ingredients used in the manufacture of the capsules and there is, of course, no surface coating to wear off or require periodic replacement. Gelatin Products officials are confident that these lightweight, durable trays will eventually pay for themselves through elimination of costly maintenance. The trays also stack better than their metal counterparts, are not cold to the touch of girls on the inspection line, and are practically unbreakable in normal use. No direct comparative cost figures are as yet available on the trays, and their life expectancy can be definitely

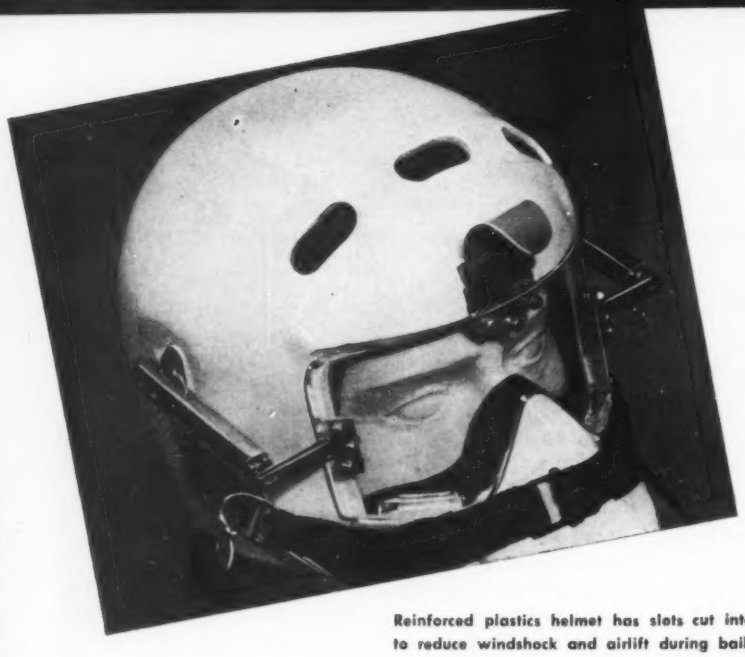
(*Continued on p.* 192)



Unlike its metal predecessor, reinforced plastics drying trays come unscathed through frequent handling during capsule inspection time



Deep reinforced plastics capsule storage trays, in contrast to their wooden counterparts, do not exhibit such shortcomings as worn edges or splinters



Reinforced plastics helmet has slots cut into crown to reduce windshock and airlift during bail-out

Helmet Stays On at Mach 1.04

PILOTS forced to bail out of aircraft traveling at supersonic speeds are protected against wind blast by a slotted helmet molded of reinforced plastics.

In contrast to the standard type of helmet, which tends to blow off at high speeds, the new rugged model remains securely attached to the pilot's head at speeds up to Mach 1.04. Under such flight conditions, three slots cut into the forward crown section of the helmet serve to relieve the internal air pressure built up inside the helmet by the wind.

Since the development is still experimental, each helmet is fitted to the individual pilot. A plaster cast is first made of the head and a clay mock-up of the helmet formed on this plaster head. Using the mock-up as a base, a three-piece plaster mold is prepared. Layers of fibrous glass cloth are then positioned inside the cavity of the mold and impregnated with a catalyzed liquid polyester resin. A vacuum bag set-up is used to apply pressure to the plies of impregnated glass cloth while cure is taking place at 250°F.

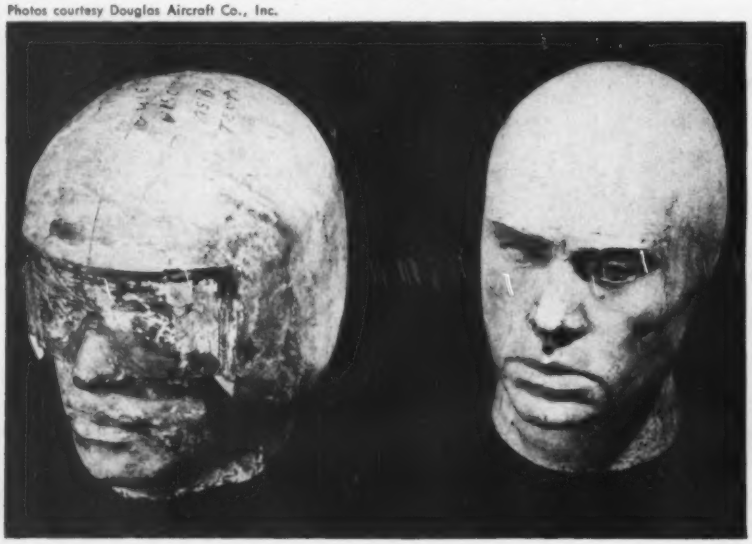
A reinforced plastics protective cover for the standard oxygen mask that is strapped to the helmet is similarly molded on a cast plaster form. The cover is attached to the mask by threading the mask straps through special slots cut into the cover.

Liners for the helmet are fabricated from flat sheets of cellular cellulose acetate. The cellular sheet is cut into small pieces that are formed to contour by being pushed against the inner surface of the outer mold. While these pieces are held in place with glue, the mold is positioned over the plaster head and foam rubber is poured between the acetate and the plaster. The rubber solidifies into a comfortable sponge-like face for the liner.

CREDITS: Helmet designed and built by Douglas Aircraft Co., Inc., Santa Monica, Calif.

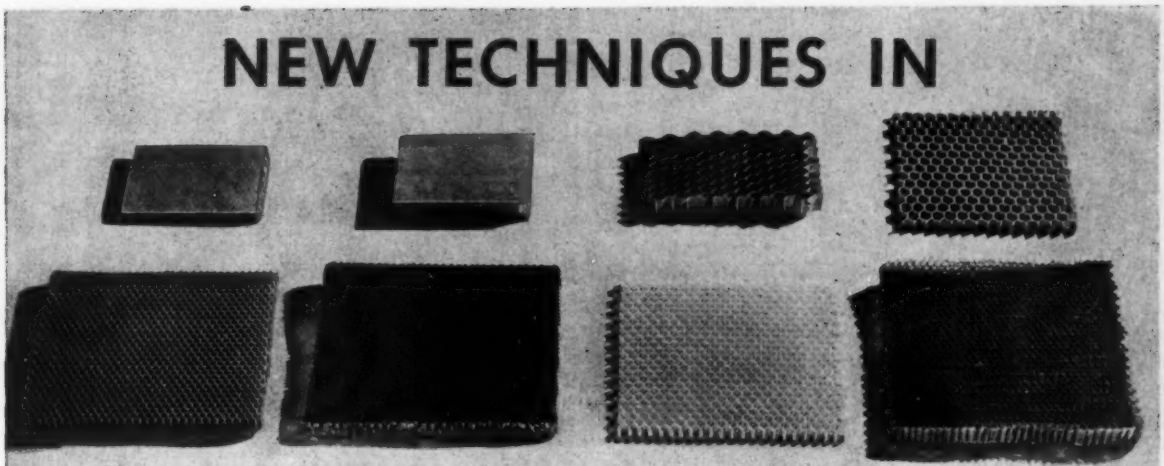
Still in experimental stage, each helmet is custom-fitted to pilot's head: first, plaster cast of pilot's head is made (right), then clay mock-up of helmet is formed on it (left)

Photos courtesy Douglas Aircraft Co., Inc.



Three-piece mold in which glass cloth is positioned, impregnated, and cured to form helmet

NEW TECHNIQUES IN FABRICATING HONEYCOMBS



. . . save time, labor and costs in sandwich panel construction

. . . contribute to an expanding market for plastics

by Roger C. Steele*

HONEYCOMB core sandwiches of woven glass fabric-plastic, phenolic-impregnated cotton fabric, or aluminum, bonded with synthetic resins, have shown a remarkable expansion in use within the past few years—and are currently on their way to new high volume. Most of the expansion has taken place in the aircraft industry, and the techniques thus learned are contributing much to the opening of new markets for honeycomb in a wide range of military and civilian applications.

In part, the growing use of the material is due to an increased awareness of the strength and reliability imparted to the material by new synthetic resin impregnants and adhesives. In a larger sense, it is due to an increased knowledge of improved methods of fabrication of honeycomb sandwiches on the part of designers, sandwich fabricators, and potential ultimate consumers.

Fabrication techniques have been developed to accommodate the specialized properties of each of the major classifications of honeycomb core: 1) glass fabric-plastic; 2) aluminum; and 3) cotton fabric.

For glass fabric-plastic cores, a special pre-shaping technique has been put to good use in the production of difficult radome shapes. Pre-shaping is designed for use where flat honeycomb cannot be formed to a severe curvature or where a more economical use of large honeycomb pieces is desired. By employing this pre-shaping technique, the fabrication process can be speeded up, savings in labor and lay-up costs can be effected, and anticlastic tendencies which distort the piece can be eliminated.

Multi-Piece Radome

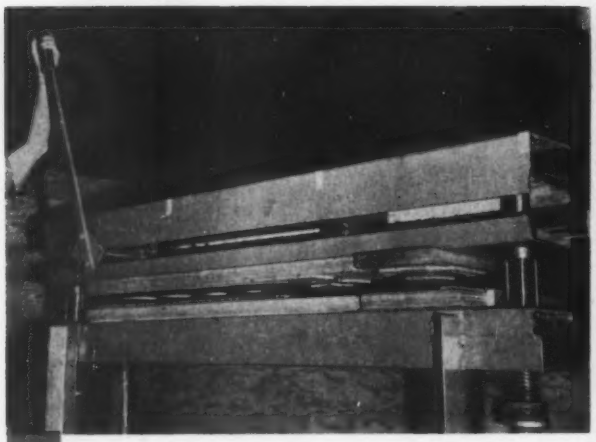
Two current applications of the technique illustrate its adaptability to different radome designs—from multi-section units to small one-piece radomes having a drastic curvature.

The multi-section unit, in the form of a nose radome for North American Aviation's F-86D Sabre Jet All-Weather Interceptor, posed a difficult production problem, particularly in view of the requirement for a variable taper in the thickness of the honeycomb.

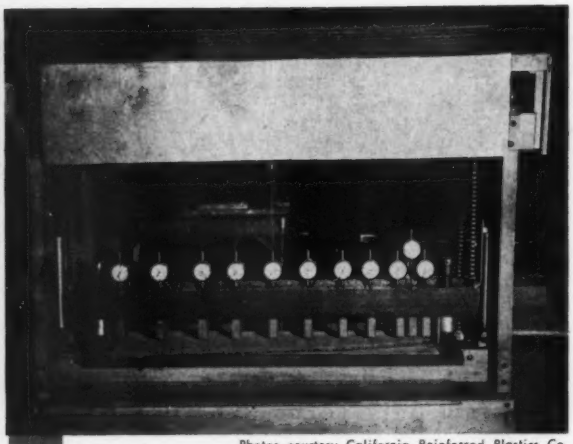
This problem was solved through pre-shaping techniques (see Figs. 1 through 4). Thirteen identical "orange peel" slices and one nose piece—all die-cut to exact dimensions and pre-curved by heating and then forming in a special die—are furnished for each F-86D radome. The pieces are readily assembled into a tight-fitting unit—ready for application of glass fabric skins by the fabricator. Each piece is cut to a tapering thickness, the nose being substantially thicker than the after sections, resulting in optimum radar transmission characteristics through varying angles of incidence encountered in service.

The use of pre-shaping in this application effected savings in cost by eliminating further trim and consequent waste, and by allowing core lay-up to be accomplished in a fraction of the time formerly required for this operation. The three types of glass fabric core used in pre-shaped applications are N.P. (nylon-phenolic), N.P.F. (nylon phenolic forming), and P.E. (polyester). In

*President, California Reinforced Plastics Co., Oakland, Calif.



1 Die-cutting 13 "orange peel" sections to exact dimensions is first step in fabricating multi-section radome for F-86D Sabre Jet



2 Each section is gaged to assure the exact taper necessary for optimum radar transmission characteristics in finished radome

Photos courtesy California Reinforced Plastics Co.

addition to their qualities of strength and light weight, these types of core provide excellent microwave transmission characteristics. Test panels have shown transmission percentages of as high as 99 at optimum angles.

One-Piece Radome

In the case of a smaller radome, formerly fabricated from many small pieces of honeycomb, the advanced methods of pre-shaping now enable the unit to be delivered to the fabricators in one piece, ready for the skins to be applied. In the production of this unit (Fig. 5), a slice of honeycomb core, large enough to cover half the radome area, is cut to a predetermined depth along specified rows of cells. The core slice is then heated between metal platens, removed, and immediately squeezed into place in a female die. The male die is then moved into position with an air cylinder and pressure is applied until the slice has cooled sufficiently to hold the curved shape. The same procedure is followed for the opposite half of the radome. Both halves are then cut with a special blade trimming die so that they will fit at the center-line.

To join these two halves, an adhesive line is first painted down the middle of the core slices at the center line. The halves are then pressed together and clamped into a plastic female die with the glue lines in contact, and the whole lay-up is oven-cured.

In addition to the ease of lay-up and savings in cost, the radome displays improved microwave transmission, because of the presence of fewer splice lines. The core which is used in this particular application is N P.F., a special honeycomb designed for applications where extreme curvature is necessary.

While glass-fabric honeycomb has long been considered essentially a radome material, fabricators also are using this core in structural applications. Under certain loading conditions, sandwich structures of glass-fabric honeycomb are more efficient than similar structures made with other core materials. This has proved particularly true in extremely lightweight structures employing very thin metal skins or single-ply fabric skins. Where high operating temperatures prevent use of ordinary glass fabric-plastic honeycombs, special heat-resistant cores can be used. This series includes the C.T.L. and B.V.Q. types, which perform well at temperatures up to 600° F. for short durations and at lower temperatures for extended periods.

Sizes and Densities

Glass fabric-plastic honeycomb is produced in blocks of approximately 4 to 5 cu. ft. and in cell sizes of 3/16, 1/4, and 3/8 inch. The blocks can be sliced to a thickness tolerance of ±0.006 in., as specified by fabricators. The cores are machine produced at a density of approximately 3 lb. per cu. ft. and dipped to additional desired densities in suitable synthetic resins.

Material feed for band-sawing slices of glass fabric-plastic honeycomb in its expanded form is approximately 3 to 4 ft. per min. with a blade speed of 5000 ft. per minute. The lighter density cores are more readily cut by running the blade backward.

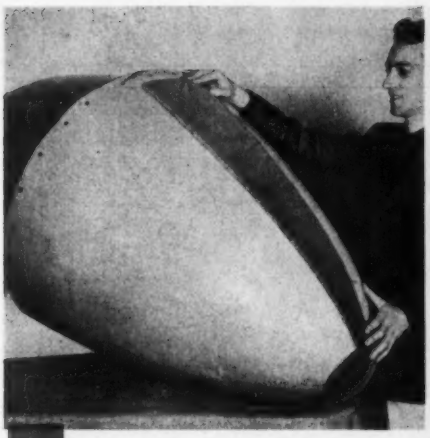
Aluminum Honeycomb

In the fabrication of aluminum honeycomb structures, one recent development is the purchase of unexpanded aluminum core—HOBE (HOneycomb Before Expansion)—by the fabricator who then cuts and expands the material as may be required.

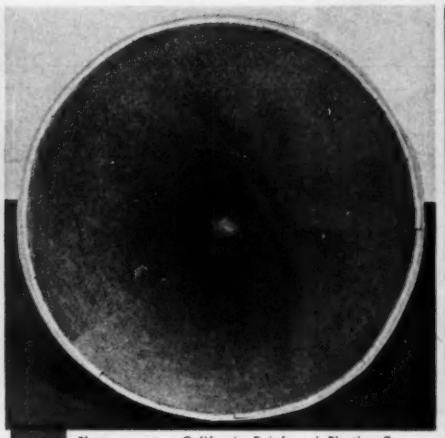
While the core is normally band-sawed into constant thickness slices, one fabricator cuts small wedge-shaped pieces (Fig. 6) which, when expanded, form the honeycomb to fill the interior of control surface trailing edges on high speed aircraft.

The construction of an F-86 Sabre Jet dive brake door by North American Aviation (Figs. 7 through 11) typifies fabrication of HOBE material. The compressed aluminum honeycomb, in large slabs or blocks, is shipped to North American where it is cut and expanded. Shipping the core in non-expanded form simplifies both shipping and storage problems, since the material for an 8-ft. expanded core measures only 2-in. wide.

The HOBE is first cut to thickness on a band saw at a feed of 0.7 to 1.5 ft. per min., with a blade speed of 2000 to 4000 ft. per minute. Ex-

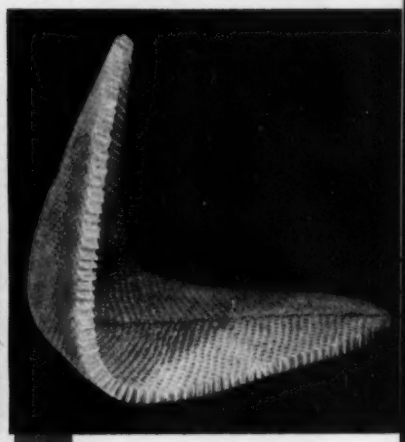


3 First of precut sections and precurved nose cap is layed up on radome form



Photos courtesy California Reinforced Plastics Co.

4 Completed lay-up of F-86D radome shows precise joints between slices, neat fit of nose



5 Glass-plastics honeycombs can be formed to radical curvature

Courtesy California Reinforced Plastics Co.

6 Small wedge of unexpanded aluminum honeycomb, contoured for a trim tab (left foreground), is expanded to 8-ft. section to fill interior of control surface trailing edge

pansion may be accomplished on a motorized table expander which allows the material to contract in width as it expands in length. The expansion ratio of an average aluminum core is 40 to 1. The expanded honeycomb is then handled in the usual manner—cut to plan and press-bonded with synthetic resin adhesives to the sandwich skins.

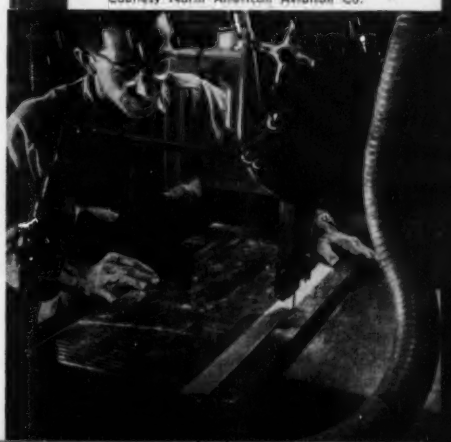
Parts of simple curvature fashioned from constant thickness honeycomb are produced by forming expanded aluminum core to the desired curvature with sheet metal forming rolls and then employing preformed skins to fabricate the panel. In some cases this step can be facilitated by bonding the core to one skin prior to forming. In the case of slight curvatures, parts may be fabricated—without forming either core or skin—simply by relying upon bonding pressure to hold the parts in a forming die during the bonding of core to skin.

Another important aid to the sandwich fabricator has been the development of the "Corelock" splice. In fabricating individual pieces of core material into larger sections or "blankets," this process provides full shear strength across the splice and allows the fabrication of units for which the only size limitation is shipping space. The individual pieces of a blanket are actually slices from blocks of honeycomb core that range in size up to 30 by 100 by 24 inches. The slices are cut to fabricator's specifications with normal tolerances of ± 0.005 inch.

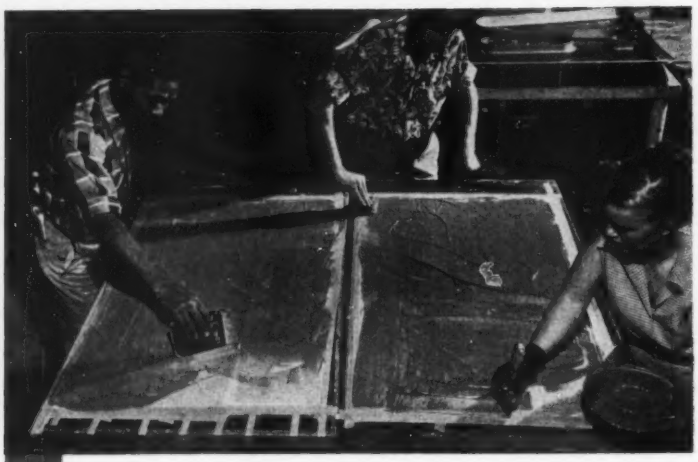
Aluminum core material is produced in $\frac{3}{16}$-, $\frac{1}{4}$-, and $\frac{3}{8}$-in. cell sizes, plus a $\frac{1}{8}$-in. cell which has

7 In making jet dive brea'c door, compressed honeycomb is first cut to size

Courtesy North American Aviation Co.



8 Expanded honeycomb is marked for cutting with templet and knife, taped, and then sawed



9 Next, cheesecloth is thoroughly impregnated with an epoxy resin adhesive; the synthetic glue is applied with spatulas to assure its being spread evenly

10 Impregnated cheesecloth is then applied to inner surface of outer skin, and honeycombs positioned on glued sections

Photos courtesy North American Aviation Co.

11 After inner and outer skins of honeycomb sandwich are firmly bonded to core, the edges are bound and riveted

proved to be the superior material from the standpoint of skin-to-core bond strength. The ⅛-in. cell size provides substantially 100% bonding area and thus upgrades both the peel resistance and tensile strength of the resin bond between the skin and the core. All cell sizes are available in the form of either plain or permeable core.

Adhesives

For the node bond of an aluminum honeycomb, vinyl-phenolic adhesives have proved most popular. In bonding the honeycomb core to the outer skin, several thermoset adhesives have been used. Since this latter bonding method requires an adhesive of exceptional strength to hold components together under the violent stresses and strains of high speed jet flight, manufacturers and end users are devoting much of their research effort towards creating new and improved synthetic resin adhesives (see "Adhesives Advance," Part 2, MODERN PLASTICS *31*, 93 *ff*, Dec. 1953).

Although the aircraft industry consumes a major percentage of the aluminum honeycomb sandwich currently produced, there are much larger potential markets which can best be reached by a continuation of the downward price trend which has been associated with the aluminum honeycomb sandwich over the past few years. Through continued research, improved methods, and better quality control, the sandwich fabricators have greatly increased the quality and uniformity of their products and at the same time have reduced prices substantially. The next major cost reduction may well be in the adhesive line between the honeycomb and skin of the structure. Adhesives employed at present cost from $4 to $8 per lb. in place in the sandwich.

Among the promising new adhesives are epoxy-base resins which

(*Continued on p.* 193)

Plastics in a Plastics Lab

THE invasion of the construction field by plastics to supersede traditional materials and to supplement them is a slow and tedious process involving extended test programs and innumerable design problems. It is therefore important news to the whole industry when a major producer of plastics materials, in constructing facilities for its own use, turns to plastics as major materials in such construction.

At Welwyn Garden City, Hertfordshire, England, the Plastics Div. of Imperial Chemical Industries Ltd., has just completed a huge multi-story laboratory building wherein plastics have been used wherever practical.

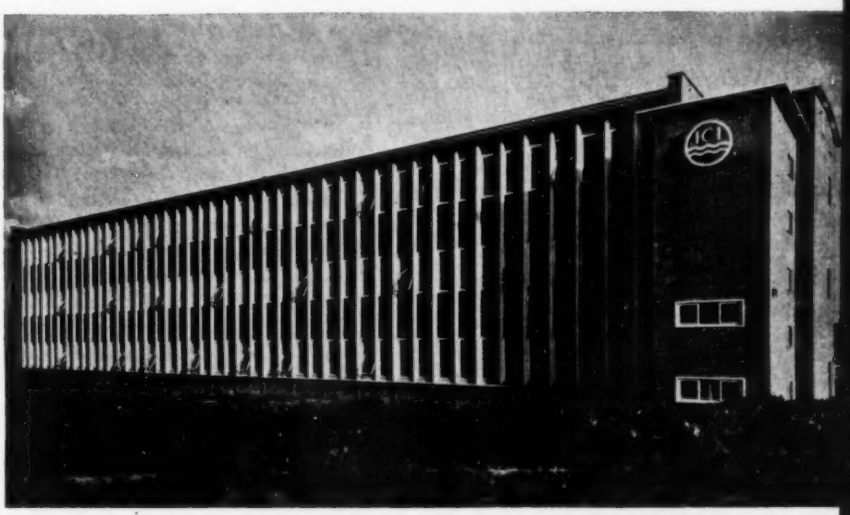
A feature of design in the new laboratory is standardization of demountable partitions; benches; service units for water, gas, compressed air, electricity, and drainage; and all cupboards and drawer units. The standard module is 4 ft., and all service fixture lines were designed so that they would fit areas based on multiples of that unit.

Both exterior walls and interior demountable partitions are made of Holoplast panels, some veneered with hardwood for built-in furniture, some filled with fibrous glass insulation and framed with aluminum alloy for exterior use, and some fitted to provide take-apart partitions for flexibility in office space. The exterior grade panels and their framing were designed to allow for movement which might occur due to temperature and humidity changes between the inside and outside of the building.

Floors are polyvinyl chloride tile, and where access panels must be provided to under-floor ducts, the laminated wood covers are faced with the same tile.

Since drainage of chemical waste is important in a plastics laboratory, each service board is provided with a drip waste consisting of an Alkathene cone and extension pipe which is inserted into, but not coupled to, a standard 4-ft. rigid P.V.C. drain. This means that the drain pipe can be easily removed, stored, and reused as required. Beneath the floor, P.V.C. piping accepts all drainage. Vinyl is also used as covering for all electrical cable. Lighting fixtures have Perspex acrylic diffusers which fit flush with ceiling panels.

According to officials of I.C.I., design for the use of plastics in this new laboratory can provide a base upon which design for plastics use in home and industry construction may be improved.



General view of laboratory building in which many structural parts are of plastics

Photos courtesy Imperial Chemical Industries Ltd.

High-pressure laminate work surfaces are widely used in the laboratories

Floors throughout the building are covered with P.V.C. tile

Reinforced Plastics Conference

Detailed program of the 9th annual exhibit and technical and management sessions

ON Feb. 3, 4, and 5, 1954, the Ninth Annual Conference of the Reinforced Plastics Div. of The Society of the Plastics Industry, Inc. will be held at the Edgewater Beach Hotel, Chicago, Ill.

Registration fee for employees and officers of S.P.I. member companies will be $15.00 per person; non-members, $25.00 per person. Government representatives will pay no registration fee.

The exhibit of recent developments in reinforced plastics will be open to representatives from end-user industries. The program of papers and panel sessions at the conference follows:

Wednesday, February 3

10:00 a.m.—Opening Session—Government Agency Forum

Welcome address: Clare E. Bacon, Owens-Corning Fiberglas Corp.

Presiding: John B. Alfers, Dept. of the Navy, Bureau of Ships.

Recording secretary: John A. Owen, The Sorg Paper Co.

The following papers on latest developments will be delivered by government representatives.

"The Application of Sandwich Type Construction to Reinforced Plastic Marine Craft," K. Telford Marshall, Transportation Research & Development Station, Fort Eustis, Va.

"Recent Developments at the Material Laboratory, New York Naval Shipyard; I—The Pullout Strength of Fasteners in Polyester Glass Laminates; II—Compressibility of Glass Reinforcing Materials," N. Fried and R. R. Winans, New York Naval Shipyard.

"Chlorosilane Finishes for Glass Fabrics" and "Variations in the Preparation of Test Panels," H. A. Perry, Jr., Naval Ordnance Laboratory.

"The Status and Plans of the Department of Defense Materials Conservation Program," Franklin P. Huddle, Office of the Assistant Secretary of Defense, Supply and Logistics.

"Materials and Process Requirements for Aircraft Plastics," D. Rosato, Materials Laboratory, Wright Air Development Center, Ohio.

"Bureau of Ships Program Report on Structural Plastics," J. B. Alfers and W. R. Graner, Dept. of the Navy, Bureau of Ships.

"Development of Navy Plastic Ammunition Containers," James W. Case, Dept. of the Navy, Bureau of Ordnance.

"The Role of Foamed Plastics in Aircraft," J. M. Stevens, Dept. of the Navy, Bureau of Aeronautics.

"Low Temperature Processing of Alkyd Diisocyanate Foams," Dr. Howard R. Moore, U. S. Naval Air Development Center.

12:00 Noon—Luncheon

Presiding: Arthur L. Smith, Rohm & Haas Co.

Recording secretary: Leonard S. Meyer, Consultant.

Reinforced Plastics Standards Committees reports: "Electrical Flat Sheet," Harry R. Sheppard, Westinghouse Electric Corp.; "Flat Sheet Structural," Billy B. Curl, Flexfirm Products; "Corrugated Panel," John S. Berkson, Alsynite Co. of America; "Housings and Appliances," E. F. Bushman, General American Transportation Corp.; "Boats," I. M. Scott, Winner Manufacturing Co.; "Chemical Resistant Applications," Robert J. Brinkema, R. J. Brinkema Co.; "Containers," A. W. Levenhagen, Molded Fiberglas Tray Co.; "Pipe," George A. Stein, A. O. Smith Corp.; "Rod Stock," Richard J. Francis, Consultant; "Decorative Laminates," Leonard S. Meyer, Consultant; "Aircraft," Robert S. Ames, Goodyear Aircraft Corp.; "Premix," Lawrence Wittman, Cordo Molding Products, Inc.; "Preform," Arthur J. Wiltshire, Apex Electrical Manufacturing Co.

2:30 p.m.—Contact Period

Molders and fabricators to remain in individual rooms.

8:30 p.m.—Industry Forums

1. "Premix," Presiding: Lawrence Wittman, Cordo Molding Products, Inc. Recording secretary: Frank W. Dennen, Owens-Corning Fiberglas Corp.

2. "Parting Agents," Presiding: James S. Lunn, Lunn Laminates, Inc. Recording secretary: R. E. Barnett, Tann Corp.

3. "Available Finishing Systems for Reinforced Plastics," Presiding: Byron Nelson, National Cash Register Co. Recording secretary: J. E. Stokes, Bakelite Co.

4. "Tooling Session," Presiding: John C. Reib, Shaw Industries, Inc. Recording secretary: Edward A. Jonasch, Allen Tool Co.

5. "New Developments in Resins," Presiding: J. S. Finger, Corrulux Div., Libbey-Owens-Ford Glass Co. Recording secretary: R. J. Brinkema, R. J. Brinkema Co.

The panel: American Cyanamid Co., H. M. Day. The Atlas Mineral Products Co., Raymond B. Seymour. Atlas Powder Co., Earl K. Stigger. Barrett Div., Allied Chemical & Dye Corp., H. A. Hoppens. Celanese Corp. of America, Marco Products Dept., Richard J. Savage. Ciba Co., Inc., John R. Charlton and Dr. Marco Wismer. Dow-Corning Corp., Myron Kin and Kenneth R. Hoffman. General Electric Co., Chemical Div., Paul V. Steenstrup. The Glidden Co., W. J. Maker. Hooker Electrochemical Co., Dr. T. C. Dauphine. Interchemical Corp., S. A. Moore. Narmco, Inc., Samuel E. Susman. Naugatuck Chemical, Div. of U. S. Rubber Co., Dr. Robert G. Nelb. Pittsburgh Plate Glass Co., E. W. Moffett. Reichhold Chemicals, Inc. D. G. Patterson. Rohm & Haas Co., Resinous Products Div., William E. Wirsch. Shell Chemical Corp., J. E. Carey. U. S. Industrial Chemicals Co., Div. of National Distillers Products Corp., Jack Greenfield.

Thursday, February 4

9:00 a.m.—A Process Panel

Moderator: W. Burdette Wilkins, Consultant. Recording secretary: Charles Hoover, Owens-Corning Fiberglas Co.

The following speakers will participate in a discussion of the various

(*Continued on p. 194*)

ADHESIVES ADVANCE

Synthetic resin adhesives are versatile performers. Because of the many ways in which an adhesive formulation can be varied, physical properties and bonding procedures can be controlled to fit the specialized requirements of a number of different materials.

The series of articles which has been appearing in *Modern Plastics* on recent advances in synthetic resin adhesives illustrates this versatility. The first article in the series ("Wood-to-Wood Bonding," p. 103, Nov. 1953) discussed the adaptation of synthetic resin adhesives to the age-old practice of joining wooden structural members. The second article ("Metal-to-Metal Bonding," p. 93, Dec. 1953) covered synthetic resins as bases for a new group of adhesives designed to replace traditional methods of joining metal parts.

The third—and concluding—article in the series, which begins on this page, deals with the use of synthetic resin adhesives in meeting the demands of a difficult and highly specialized application—bonding glass to itself and to other materials.

Glass Bonding

by Frank Moser*

No. 3 of A Series†

ADHESIVES to be used in bonding glass to itself or to other materials must possess certain physical and chemical characteristics.

Most desirable—especially where the assembly is all-glass or glass and some other transparent solid—are, of course, clarity and optical properties. Under some service conditions, however, a dark-colored adhesive can be used, providing such other qualities as strength, low temperature flexibility, and superior moisture resistance, are present in the adhesive bond.

Aside from color requirements, the cured adhesive film in a glass-to-glass assembly should also be pliable and possess low-shrinkage qualities. Brittleness and excessive shrinkage are apt to cause stresses to develop in the assembly which would ultimately be great enough to result in failure of the glass.

Glass has a very adsorptive surface and readily accumulates water vapors. This factor makes the adhesion of glass surfaces a more difficult job than the adhesion of any other surfaces, particularly in a humid atmosphere. Therefore, good moisture resistance is an outstanding requirement for formulation of a successful glass adhesive.

Finally, a glass adhesive should be chosen on the basis of the heat and pressure required for cure. Adhesives that set at room temperatures and need only sufficient pressure to insure intimate contact of the surfaces are the ideal bonding agents for a glass-to-glass assembly. Heat-setting adhesives, however, which cure at temperatures between 250 and 300° F. and under pressures from 100 to 200 p.s.i., are acceptable. Such adhesives usually result in a good bond providing that care is taken to control the cooling cycle. Too abrupt a change from curing temperature to room temperature is apt to fracture the glass.

Bonding Procedures

To meet the critical demands listed above, the bulk of today's glass adhesives are formulated with synthetic resins. Commercial adhesives currently available to the glass industry include those based on such resins as polyvinyl butyral, polyvinyl acetate, epoxy, acrylic, cellulose nitrate and acetate, phenol formaldehyde, urea, alkyd styrene, and the synthetic rubbers.

On the basis of moisture resistance, adhesives for bonding glass to glass would line up in this order: Adhesives based on heat-cured epoxies, modified phenolics, thiokols, silicones, and cross-linked vinyl combinations are considered best for glass. The room-setting epoxy, alkyd styrene, vinyl butadiene-acrylonitrile, neoprene-phenolic, and the rubber-based adhesives have fairly good moisture resistance. Adhesives based on vinyl acetate, vinyl copolymer cellulose-shellac, and acrylic resins are recommended only for interior applications, since their moisture resistance is the lowest of all the glass-to-glass adhesives.

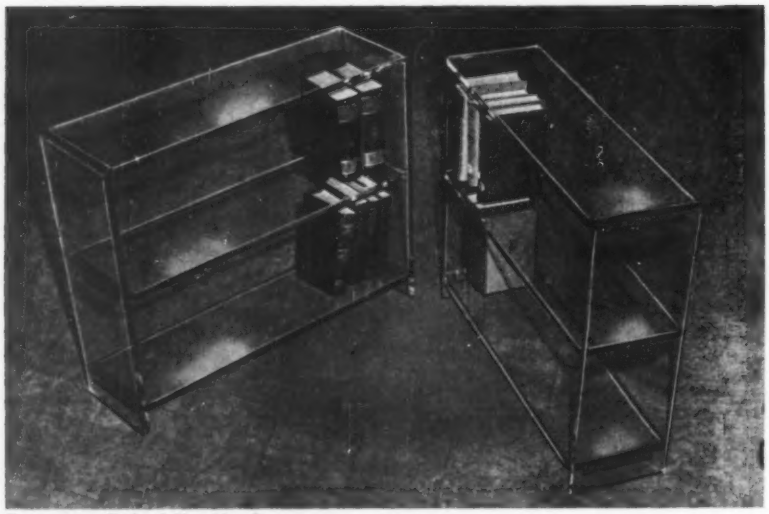
Because of the non-porous surface of glass, the film type of adhesive which wets the surface upon the application of heat and solidifies under heat and pressure is considered most desirable. The majority of commercial adhesives, however, are available only in liquid or solvent form which hardens into a solid upon volatilization of the solvent from the polymer combination. This type of adhesive may be advantageously used for glass bonding providing that a sufficient air-drying period is allowed for the volatiles to escape.

For increased strength and a more permanent bond, activation of the unassembled, adhesive-coated glass at moderate temperatures is recommended. This type of heat treatment removes all possible solvents in the adhesive before assembly and curing operations.

When tested on vinyl acetate adhesives, preheating increased the strength of the adhesive bond from 500 to 2000 p.s.i. Polyvinyl butyral adhesives that were preheated before

* Pittsburgh Plate Glass Co., Research Laboratories, Creighton, Pa.
† The first two articles of this series appeared in November and December 1953.

Safety glass — largest volume market for glass-to-glass adhesives — is made by laminating sheets of glass together with polyvinyl butyral adhesive film (right) as interlayer



Photos courtesy Pittsburgh Plate Glass Co.

Modified vinyl-phenolic adhesives used to join glass shelves to the glass walls of a bookcase provide a neat, moisture-resistant, and durable bond

assembly increased in tensile strength from 800 to 1500 p.s.i., cellulose nitrate-vinyl adhesives increased from 500 to 1600 p.s.i.

Commercial Adhesives

Polyvinyl butyral adhesives, used almost exclusively in providing adhesion and furnishing the interlayer for laminated auto safety glass, are the most commonly used in the glass industry.

Modified phenolics, in combination with vinyl butyral resins, produce perhaps the most durable of the glass adhesives. Adhesives based on these resins have tensile strengths of about 1500 to 3500 p.s.i. and good water resistance. Colors for most adhesive formulations in this class vary from light amber to a very light straw color.

Other phenolics, such as oil modified-phenolics, tertamyl-phenol-aldehydes, and cresylic substituted phenol-aldehydes, in combination with polyvinyl-butyral, also make a durable bond and are recommended for out-of-doors applications. Glass assemblies joined with this type of adhesive are not recommended, however, for exposure at —40° F., since differential expansion may cause glass chipping or fracture. These phenolic adhesives adhere well between two glass surfaces, between glass and cyclized rubbers, and between glass and metal.

Adhesives with more flexibility than those already mentioned are based on rubber-phenol and butadiene-acrylonitrile-vinyl resins. Used in bonding glass to metal and glass to rubber, these adhesives have tensile strengths that range from 1200 to 3000 p.s.i. Other formulations based on Buna-N-phenol-aldehyde resins give excellent adhesion between glass and Buna-N rubber, without any cyclization of the rubber surface by H_2SO_4 treatment. Tensile strength of this adhesive bond is on the order of 600 p.s.i.

Recent Developments

Epoxy resin adhesives have, within the past two years, proved exceptionally well adapted to the bonding of glass to glass and glass to dissimilar surfaces. The epoxies set at room temperatures and require only contact pressure for assembly; their color varies from light amber to almost water white; the amine-catalyzed types have tensile strengths of 500 to 2000 p.s.i., depending upon the modification of the adhesive formulation. One disadvantage of the epoxy adhesives is their tendency to become somewhat brittle at low temperatures (0 to —40° F.), often causing the surface of the glass to chip. This is more noticeable in a glass-to-metal bond than between a glass-to-glass assembly.

For more desirable adhesive film properties, phenol-aldehyde, alkyd, and acrylic resins are being combined with epoxy resins. Various plasticizers can also be added to the formulation to obtain a more flexible glass adhesive.

Heat-cured epoxy adhesives have a higher tensile strength than the room-setting types and better moisture resistance. Tensile values as high as 2000 to 3000 p.s.i. have been obtained with heat-cured epoxy adhesive bonds. Since bonding temperatures are relatively high (200° C.), however, the curing process necessitates close control of the cooling cycle.

Another recent major development in adhesive technology is a new acrylic resin adhesive created for bonding glass to glass and glass to methacrylate. The acrylic resin is in the form of a syrupy liquid and is kept in place between the two members of the assembly by tapes. The adhesive

is catalyzed by light and heat—it will set in sunlight or, if an accelerated cure is desired, under a 20-min. exposure to an ultraviolet lamp—and requires only contact pressure for bonding. Special techniques are used during the cure to regulate film thickness and to control shrinkage. The cured adhesive film has a bonding strength which ranges from 600 to 1000 p.s.i., and excellent clarity and optical properties.

Adhesives Applications

Adhesive applications in the glass industry include, among others, laminated glass, adhesion of structural and decorative glass, and the adhesion of glass to dissimilar materials in a number of special applications.

Safety glass and bullet resisting glass are formed by laminating sheets of glass together with a polyvinyl butyral adhesive interlayer. Glass partitions for home, industry, or commercial store interiors are joined either by thermoplastic resin adhesives or by solvent-activated film type adhesives. Rubber mastics are used for the installation of store fronts.

For adhering glass knobs to glass surfaces, a peroxide-catalyzed alkyd styrene mixture is available. This adhesive sets at room temperatures and requires only 48 hr. to form a permanent bond with good clarity and a shear strength of 1500 to 2000 p.s.i.

For bonds requiring special heat resistance, a silicone rubber type of adhesive may be used. This type has an opaque color and good heat and water resistance. Its strength, however, is low.

Special Applications

Synthetic resin adhesives have found particular use where adhesion problems are of a special nature.

One such problem concerned the choice of an adhesive with which to attach a glass finger pull to a sliding glass door. Because of the continuous abuse to which the finger pull would be subjected, the adhesive bond had to be exceptionally durable. The answer was found, in one case, by bonding the handle to the door with a room temperature-setting epoxy adhesive. In another similar application, the handle was laminated to the door with good success with a polyvinyl butyral adhesive.

Another example of a special use of synthetic resin adhesives is the attachment of a rubber bumper strip to the glass back stops used in indoor hockey arenas. In this case, the choice of an adhesive is dependent upon the type of rubber selected for the strip. If the interior of the strip is cyclized, any heat-curing modified phenolic adhesive will provide a durable bond between rubber strip and glass. If, however, the rubber is cleaned with a solvent, a special formulation compatible with the particular type of rubber is necessary.

Glass-to-Dissimilar Materials

From this brief review of glass adhesive applications, it is obvious that while the adherence of glass to itself or to similar materials is, comparatively, not too difficult, the adhesion of glass to dissimilar materials presents various problems requiring special techniques.

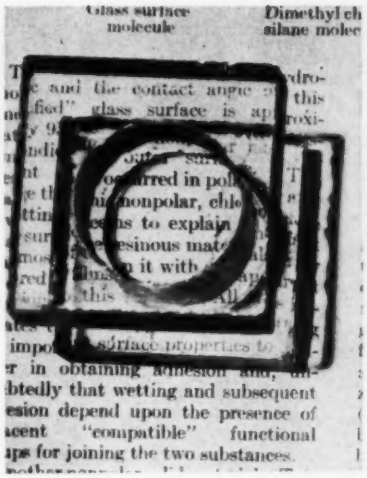
The basic problem in this respect is to secure compatibility of the resinous adhesives with the different types of bonding surfaces. Such compatibility is determined by the effectiveness of the various factors involved in securing adhesion—molecular attractive forces, electrostatic attractions, induction, orientation, and polarization forces. These forces are, in turn, controlled by the polymer structure of the adhesive, the presence of reactive (functional) groups, wetting of surfaces, and the polarity of the various adhesive constituents.

The theoretical principles of attractive influences are more easily visualized if a practical adhesive application is cited. In attempting to adhere glass to cast phenol-aldehyde, for example, the dissimilarities between the two materials raise many problems. Contact angle measurement for glass is 0 degrees; for the cast phenol-aldehyde, 62 degrees.

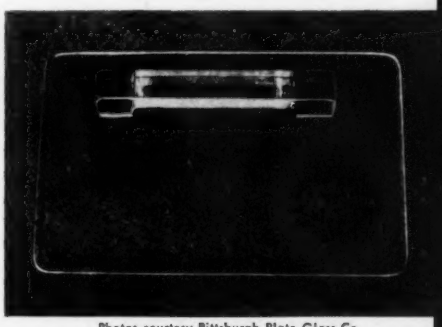
Adhesion may be accomplished in this case by either of two methods. First, a specially prepared mixed (polyfunctional) adhesive, having both polar and non-polar groups in the adhesive molecule, may be applied to each of the surfaces. Thus, during the curing process, an intermolecular arrangement occurs which allows for the polar group to be aligned on the glass while the non-polar groups attach to the phenol-aldehyde.

Second, adhesion may be obtained

(*Continued on p. 199*)

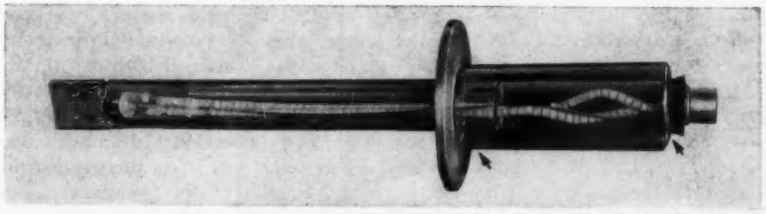


Clarity of resin adhesive is prime requisite in bonding glass to glass



Photos courtesy Pittsburgh Plate Glass Co.

Bonding acrylic handle to plate glass requires special techniques



Courtesy Ciba Co., Inc.

Using epoxy resin adhesive as the bonding agent, a glass tube is economically and accurately sealed in two places (arrows) to the metal parts of an electronic unit

Big Elastomeric Molding

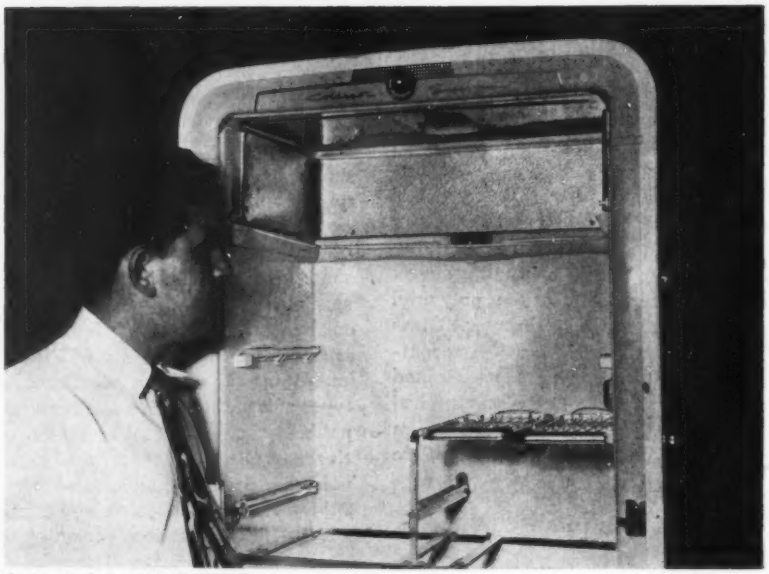
Drain rail for refrigerator with automatic defrosting weighs over 21 oz., is 4½ ft. long; its flexibililty permits water-tight fit

AUTOMATIC defrosting, regulated by an electric clock mechanism, is one of the greatest boons brought to the housewife by the modern home refrigerator. In Sears, Roebuck & Co.'s new Coldspot Super-Mart freezer-refrigerator, manufactured by Seeger Refrigerator Co., Evansville, Ind., an important factor in the successful application of the defrosting process is an elastomeric vinyl component which is one of the largest and most complicated parts ever molded of this material.

The vinyl part is a defroster drain rail, function of which is to catch defrost water from the freezer unit located near the top of the refrigerator interior. Mounted in a horizontal position just beneath the upper chill shelf and hugging the side and back walls of the food compartment tightly, the rail carries defrost water to the back of the cabinet and through the rear wall of the refrigerator via an integrally molded spout. The spout, in turn, is connected to a metal drain tube which passes down the back of the appliance, conducting the water to a shallow metal drain tray concealed beneath the refrigerator. Here the water evaporates; no emptying of the drain pan is required.

The design of the elastomeric vinyl drain rail was perfected by Seeger engineers, working in cooperation with the molder. Injection molded of white vinyl material having a Durometer A hardness of 90, the part weighs 21½ oz., measures 4½ ft. from tip to tip, and has a maximum width of approximately 2 inches. The integral spout projects about 6 in. from the center of the back section of the rail.

Although the top edge of the drain rail is horizontal when the piece is mounted in the refrigerator, the component is designed with a taper along the bottom so that the trough itself actually slopes toward the back of the refrigerator along the sides and is pitched toward the center in the back section. The flexible nature of the vinyl material permits the rail to fit snugly against the walls of the food compartment. All defrost water is thus trapped by the drain rail; none can seep past the rail and dampen the walls of the refrigerator below the freezer compartment.



Courtesy B. F. Goodrich Chemical Co.

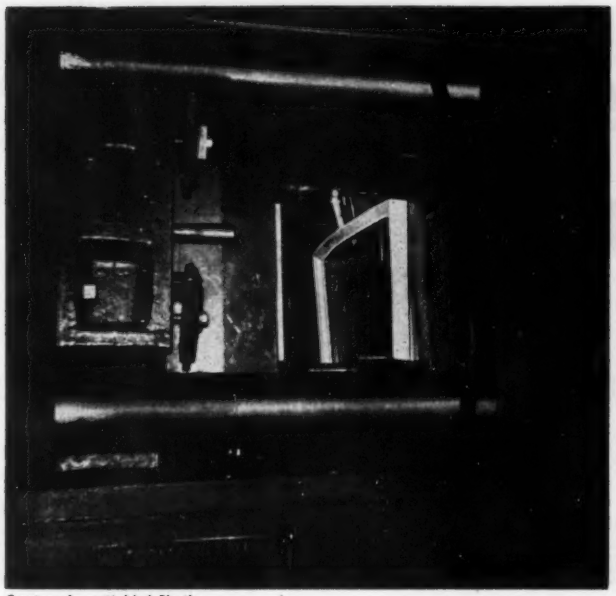
Molded elastomeric vinyl drainage rail, mounted directly beneath chill shelf near top of cabinet of new refrigerator, contributes to efficiency of automatic defrosting

Mounting Clips

Molded-in vertical ribs—eight along each side and 10 in the back section—serve to reinforce the elastomeric piece. Also molded-in along the entire top edge of the back surface is a ⅜ in. deep undercut flange or rim. When this rim is forced over specially designed metal mounting clips, the drain rail is drawn tightly against the refrigerator walls.

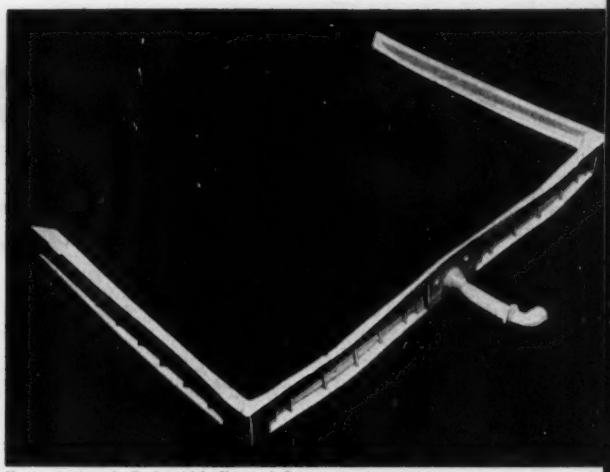
Specification of elastomeric vinyl for the Super-Mart drain rail was based not only upon the service requirements of the component, but also on molding and assembly considerations. As pointed out by L. G. Holder of Seeger Refrigerator Co., the part had to be made of elastomeric material in order to be molded and to permit assembly in the finished refrigerator. A similarly designed part in a rigid plastic material would not only have been virtually impossible to mold in one piece, but also could not have been snapped into position so readily. The fact that the rail and nozzle could be molded integrally in the flexible plastic material eliminates the need for any assembly operations on the part itself and simplifies installation.

From the performance standpoint, elastomeric vinyl is ideal for this application. It withstands temperature changes without becoming hard and brittle, maintains its clean white appearance, and is easily cleaned. It imparts no odors to stored foods and is not affected by contact with foods, greases, etc., placed in the refrigerator. Periodic contact with water in the defrosting process causes no deterioration of the plastic. The excellent elasticity and impact re-



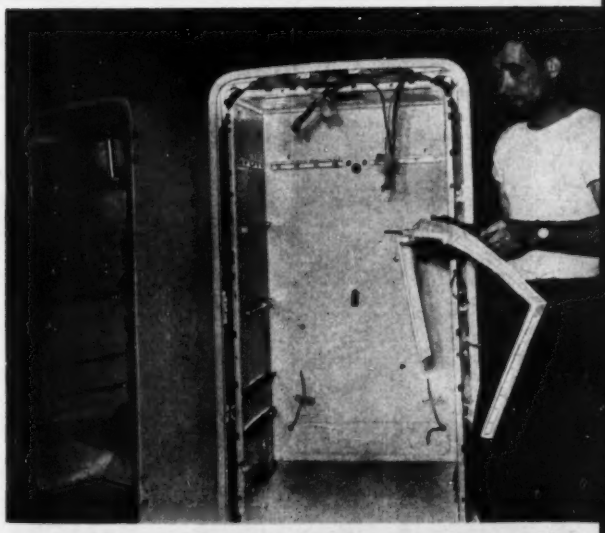
Courtesy Amos Molded Plastics

Molded part just prior to removal from 28-oz. injection machine; despite intricate undercuts, the flexible piece is stripped off core without damage



Photos courtesy B. F. Goodrich Chemical Co.

Close-up of completed part. Vertical supporting ribs are molded-in; undercut lip along top snaps in place over steel strips in cabinet



To install drainage rail in cabinet, nozzle is pulled through hole visible in back wall of refrigerator. Metal strips over which plastic rail will be snapped are located on all three walls

After spout has been pulled through hole in cabinet wall from inside, drain rail is snapped into place over metal supporting strips along refrigerator walls with aid of a rubber mallet

sistance of the drain rail are not impaired by the low temperatures present in the refrigerator.

Production Problems

The elastomeric vinyl drain rail is produced in a single-cavity mold on a 28-oz. injection machine at a rate of 40 shots per hour. The mold is chrome plated to resist the corrosive action of the material. The piece is gated at two points in order to shorten the flow of material necessary to fill out the mold. Along with accurate cycling, the use of a mold temperature control unit and a weigh-feeding device to meter the proper amount of material into the plasticizing chamber for a single molding shot are given an important share of the credit for the successful production of this part.

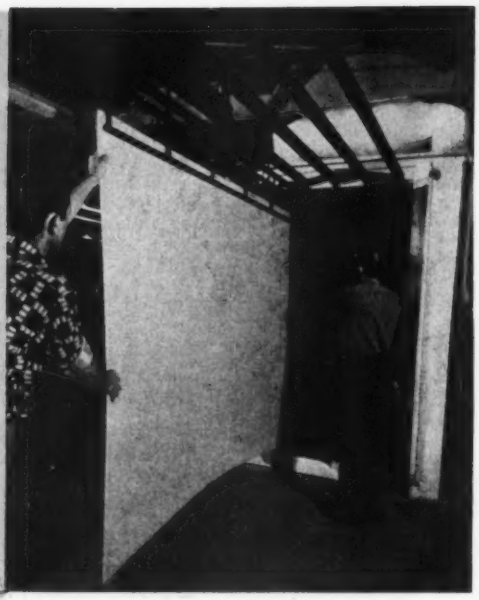
The principal problem which had to be overcome by the molder in making this unusual component consisted of maintenance of dimensions to insure an accurate fit in the refrigerator cabinet. Obviously, if the rail did not fit snugly in place against the refrigerator wall, water would leak past it and its efficiency as a drainage unit would be lost.

The free flowing characteristics of the elastomeric vinyl material in the plasticized state also are con-

(*Continued on p.* 200)

Super Sign for SHELL

Day-night roadside display sign, fabricated of formed acrylic sheet, is 13 ft. in diameter



One half of formed acrylic sign is hoisted into position on roadside billboard; second half will be joined to it with bolts to complete the installation

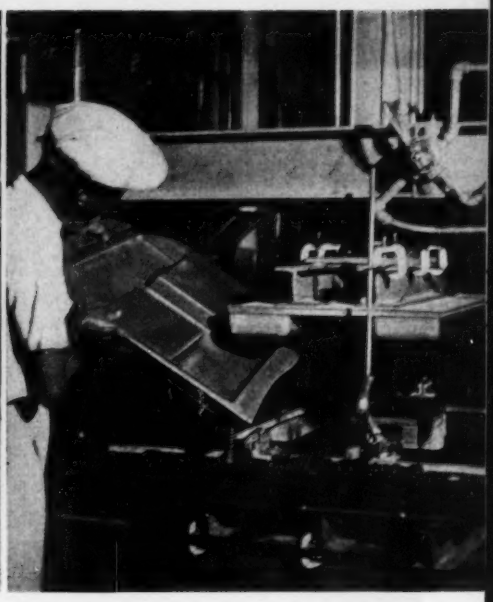
Flat sheet is guided into oven; after heating, it will be ready for forming

OUTDOOR advertising displays in plastics have taken another giant step forward with the successful fabrication of a series of large-size, all-acrylic Shell Oil Co. emblems for use on the company's paint bulletins, commonly called billboards.

These translucent, backlighted displays, having a diameter of 13 ft., maximum depth of bow of 14 in., and letters measuring 34 in. high, are among the largest lighted acrylic signs ever made for outdoor use.

The emblem, duplicating the shape and contours of Shell's well known trademark, is fabricated in two panels which, at the time of installation, are joined to form the complete shell. Each panel consists of three sheets of ⅜ in. thick translucent yellow Plexiglas. These sheets are butt-welded prior to forming. Weld seams run horizontally, and their location is so chosen that they are obscured by the horizontal elements of the letter outlines molded into the formed sheet.

After the three-piece sheet, which goes to make up one-half of the background shell, has been heated, it is formed on a cast phenolic male mold, without use of vacuum, to the desired contours. Raised letter outlines on the background shell, which serve as bases to which the letters are later cemented, are formed as part of this same operation. The fe-



Photos courtesy Rohm & Haas Co.

Each sign is formed in two halves on cast phenolic male molds without use of vacuum; female mold (top) serves mainly to dimension shell flutes and mark raised letter outlines

Translucent red acrylic letters are formed on cast phenolic male molds, using female vacuum tank

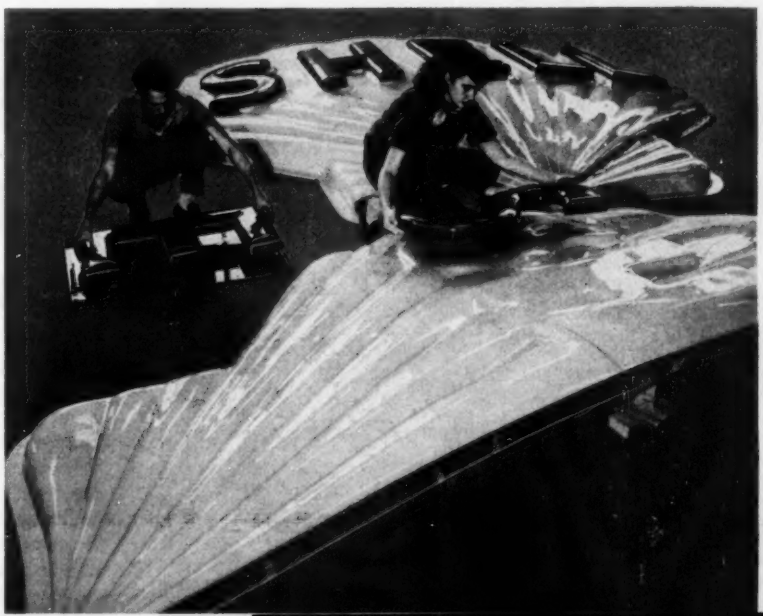
male mold for the background panel is a wooden skeleton, main function of which is the dimensioning of the shell flutes and the clear marking of the raised letter outlines.

The 34 in. high red translucent acrylic letters are molded on cast phenolic male molds into a female vacuum tank, using the snap back principle. After the formed letters have been trimmed, they are cemented over their outlines.

Before being installed on the bulletin, each half of the trademark is mounted over a cut-out section in a ¾-in. plywood, semi-circular background. They are then joined by bolts through transparent acrylic flanges cemented perpendicular to their backs. The joining edges are wedge-shaped, one male, the other female, so that a non-bonded scarf joint is obtained.

Backlighted by a neon grid, the striking display is visible for long distances at night; by day, its bright gleaming colors make it stand out from other signs. It is, however, not only an attention getter for Shell. It is also a monument to the versatility of plastics materials and fabricating techniques.

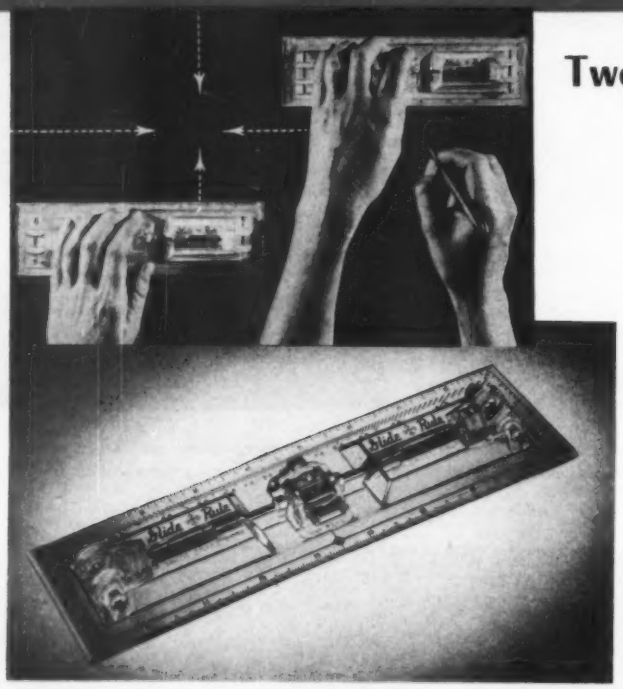
CREDITS: Fabrication of sign by Steiner Plastics Mfg. Co., Inc., Glen Cove, N. Y. Cast phenolic molds by Steiner, using material from Rezolin, Inc., Los Angeles 45, Calif. Plexiglas by Rohm & Haas, Philadelphia, Pa.



Formed letters, after being trimmed, are cemented over their respective letter outlines which have been molded into background panels

Back-lighted by neon grid, sign has impressive nighttime visibility, serves as excellent attention getter

PLASTICS



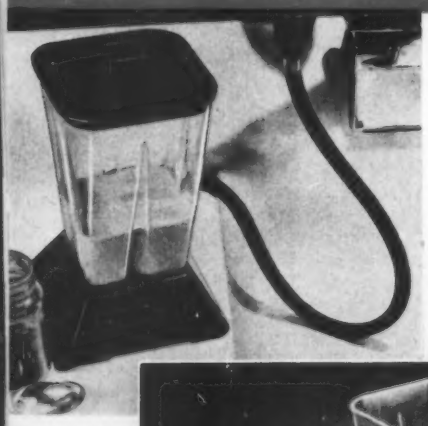
Two-Directional Drawing Ruler

Transparent drawing and navigational instrument, called Glide-Rule, can be rolled in either of two directions on six styrene wheels. Four wheels, two on each end, allow the ruler to be rolled lengthwise when a button is pressed. Moving the button to another position lowers the center of the ruler and engages two wheels that permit the ruler to move up and down.

The instrument has accurate, engraved scales and protractor. Four drawing edges have scales in 16ths and 20ths; the protractor is a full 180°, with emphasized 30°, 45°, and 60° angles.

The Glide-Rule is molded in a 4-oz. machine using a 3-plate pin-gated single unit injection mold with a cycle of approximately 34 seconds. The body is hot stamped with scales and then stress-relieved in a continuous-process hot-air oven. The wheels are a press-fit to metal axles.

CREDITS: Manufactured by Smith Drake Corp., 1206 S. La Brea Ave., Inglewood, Calif. Styrene supplied by Koppers Co., Inc., Pittsburgh, Pa.



Styrene Blender Powered by Water

Tap water forced through a small nozzle in a jet-like stream provides the motive power for this drink and food blender. The water stream activates an impeller in the base of the unit which in turn rotates stainless steel blending blades at speeds in excess of 10,000 r. p. m. The temperature of the water used to power the blender controls the temperature of the mixture. The blender is to be used in the sink or on the drainboard and is capable of mixing liquids, cooked vegetables or fruits, and whipping cream and egg whites. Cracked ice can be safely used in the blender.

The base, cover, nozzle, and impeller are of high impact styrene and the container section is molded of general purpose styrene. All parts of the blender are molded on a 22-oz. injection machine from three separate molds.

CREDITS: Molded by Injection Molding Corp., Div. of Whyte Mfg. Co., Inc., New York, N. Y. for Aqua-Matic Products Co., 6 Poole St., Oceanside, N. Y. Styrene supplied by The Dow Chemical Co., Midland, Mich.

PRODUCTS

Portable Insulated Beverage Case

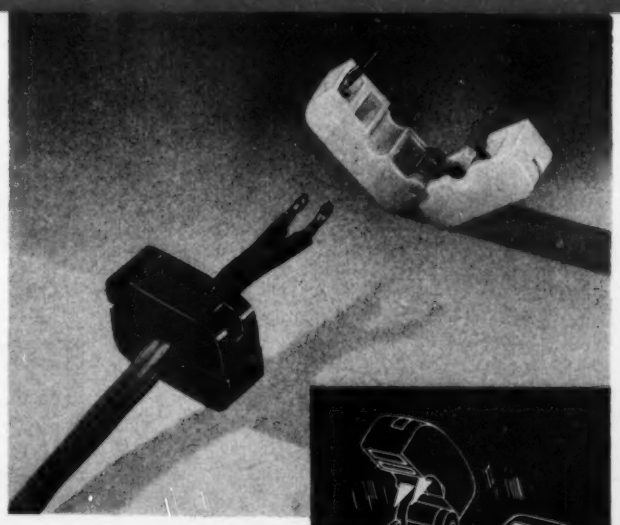
Made in the shape of a binocular carrying case, a two-quart beverage case has fibrous glass insulation between inner and outer shells. The entire top cover of the case can be removed so ice cubes or portions of hot food can be placed inside. Smaller cap on the cover seals a pouring spout.

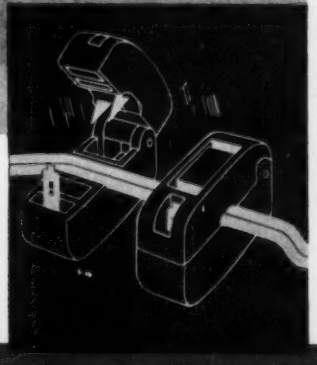
The inner shell, cover, and cap, molded of polyethylene, are washable, non-toxic, odorless, and liquorproof. Strong, lightweight outer shell is molded of fibrous glass reinforced polyester and is decorated in a variety of colored prints.

Polyethylene parts are injection molded. Polyester shell is produced on a 30-ton press using matched metal single-cavity molds. A molded flange on the polyethylene cover locks it securely to the container and forms a waterproof seal.

CREDITS: Made for Pierson Industries, Ltd., Waterbury, Conn. by Waterbury Companies, Inc., So. Main St., Waterbury, Conn. Polyethylene supplied by Bakelite Co., New York, N. Y. Polyester resin by American Cyanamid Co., New York, N. Y. Fibrous glass by Owens-Corning-Fiberglas Corp., New York, N. Y.

Clip-on Molded Outlets





Additional electrical outlets can be provided by a device called Add-A-Tap, by clamping it to any point of an existing cord. The connection is completed by internally mounted metal points that pierce the insulation and contact the copper wire. The insulation is not removed from the wire and thus any danger of shocks or shorts is eliminated.

Two hinged sections form the unit. A groove in one section centers standard #18 double wire in position. The metal contacts in the other section complete the circuit when the unit is closed. A metal insert on one end of the unit locks the two sections together to prevent opening when in use.

The molded parts are compression molded of urea in a 10-cavity mold. The metal points and locking mechanism are not molded into the body, but are assembled after molding.

CREDITS: Molded for Academy Electrical Products Corp., 3842 9th Ave., New York, N. Y. by Washington Molding Co., Inc., Port Washington, L. I., N. Y. Urea supplied by American Cyanamid Co., New York, N. Y.

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PLASTICS ENGINEERING*
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Flame-Spraying of Polyethylene

New process is applicable to porous or non-porous surfaces, does not degrade the plastic.

by Randolph A. Wiese†

WORK recently completed on the first phase of a research project for the U. S. Atomic Energy Commission has resulted in the development of a satisfactory system for applying flame-sprayed polyethylene linings or coatings to porous as well as non-porous surfaces. The immediate problem was the lining of the concrete wall of a decontamination cell at Brookhaven National Laboratory which may be washed with nitric acid if necessary; the research also involved the development of techniques for application of flame-sprayed polyethylene to other materials of a porous and non-porous nature.

To fulfill all requirements, two different lining or coating systems had to be developed. One is required for concrete and other surfaces which are porous and which produce vapor pressures when heated; the other is for metals and other surfaces which do not produce vapor pressures when heated. For porous surfaces, the system includes application of a resin sizing, a coating of a resin cement, an intermediate layer of a mixture of silicon dioxide and polyethylene, and an outer layer of flame-sprayed pure polyethylene; for non-porous surfaces, the sizing operation is omitted.

Equipment Used

The work, as described below, is carried out with Powder Weld equipment which is designed for flame-spraying a number of materials and compositions. The main variations in the apparatus for handling one or another group of materials are in the choice of fuel and carrier gases and in various types of nozzle assemblies.

The equipment used for flame-spraying polyethylene and compositions used in producing polyethylene linings, has to have three distinct functions which must be correlated to produce the lining or coating desired, yet each function must be under the control of the operator:

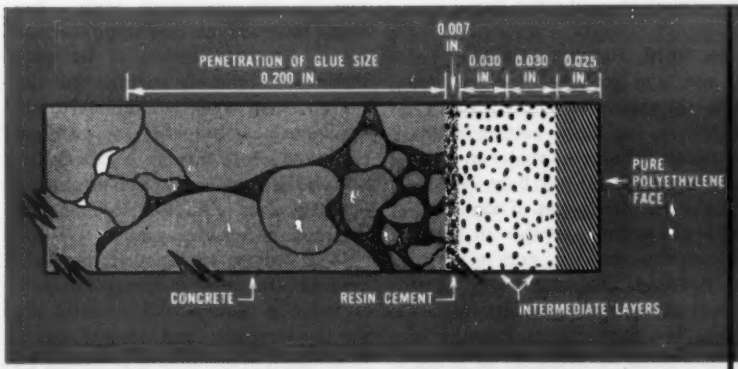
1) The delivery of predetermined amounts of gas-suspended, powdered fragments through the torch nozzle must be even, steady, and easily varied by the operator.

2) The delivery of an independently controlled quantity of shield gas through the torch nozzle must be subject to instant change in volume and force by the operator.

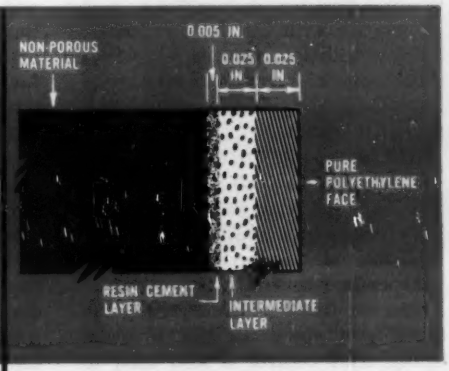
3) The delivery of independently controlled quantities of fuel gas and oxygen to the torch nozzle must be subject to needle valve change and adjustment at the torch handle, as well as at the gas cylinders.

The first of these functions depends upon the design of the material container, or hopper, together with the carburetor, hose system, and control valves. A thumb valve on the torch handle enables the operator to start and stop the flow of powdered material at will. Diaphragm valves located on the control panel near the material container are provided to enable the

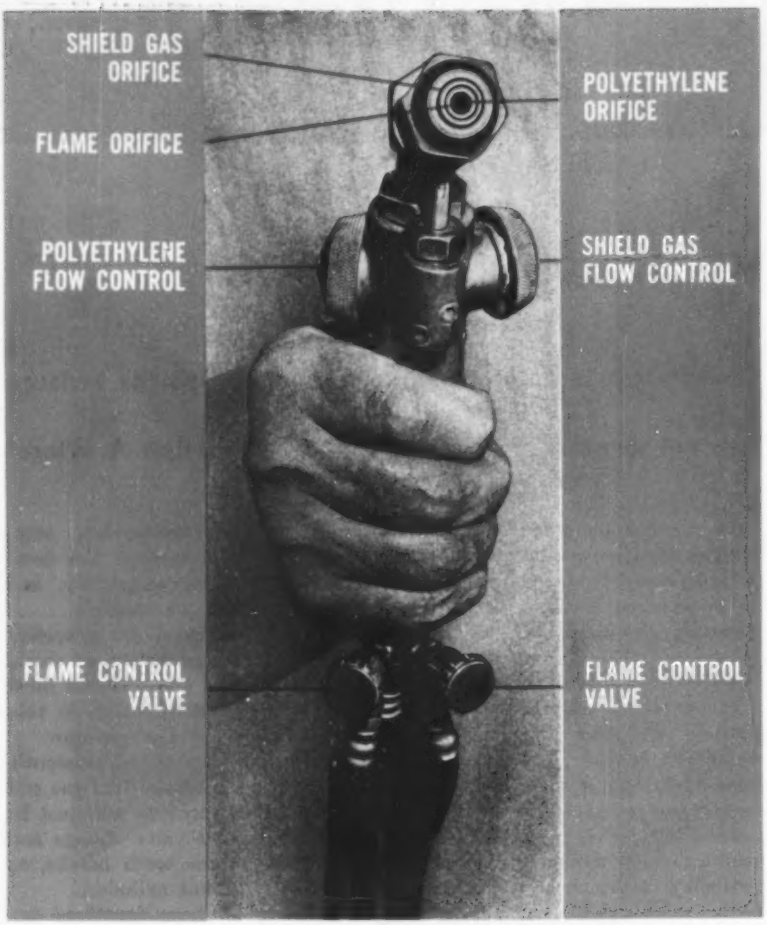
* Reg. U. S. Pat. Off.
† The Powder Weld Process Lab., Brooklyn, N. Y.



Glue size, resin cement, polyethylene-silicon dioxide mixture, and finally pure polyethylene are applied in successive layers, of depths indicated above, to surface of porous material (concrete) to produce satisfactory flame-sprayed polyethylene coating



In coating non-porous materials, such as sheet steel, no sizing glue and only one intermediate layer of polyethylene-silicon dioxide mixture is necessary



Close-up of specially designed torch for flame-spraying of polyethylene, showing location of various controls and orifices. By adjusting volume of shield gas which surrounds flame and polyethylene, temperature of sprayed polyethylene can be controlled. This torch also permits variations in spray conditions without change in flame setting

operator to select and predetermine the mixture of powdered material and carrier gas delivered by the carburetor. A wide range of mixtures is possible, from a heavy flow of powder with little gas to nearly all gas with few powder fragments. This material-carrier gas mixture is completely independent of all other torch functions.

The second function is controlled by a second thumb valve on the torch handle. Since full line pressure and volume of shield gas are always available at the torch handle, this independent control enables the operator to increase or decrease the force and speed of the material spray. This control is also used to vary the temperature of the material spray and, indirectly, the temperature of the surface being sprayed. As the two valves are side by side under the thumb of the operator, they enable the operator to vary the spraying conditions at will without changing the flame setting.

The third function—delivery of fuel gas and oxygen to the torch nozzle—is controlled in the torch itself, where the flame setting is independent of both the material mixture and the shield gas flow. Needle valves at the back end of the torch handle allow the operator to select and set the amount and type of flame wanted. Diaphragm valves at the fuel gas and oxygen bottles control the flow to the torch. Because of the independent control of these three parts of the Powder Weld System, it is possible to select and set a flame and then vary the spraying conditions without changing the flame setting.

Dry compressed air is satisfactory for use as the carrier gas for flame-spraying polyethylene. Other materials are sprayed with dry nitrogen and provision is made at the control panel to mix two gases if desired. Propane or hydrogen are the best fuel gases for use with polyethylene.

Polyethylene on Concrete

Producing a hot-melt polyethylene lining on concrete and other porous surfaces was the difficult part of the original problem. First attempts to seal off the concrete surfaces were failures, due to the necessity of bringing the polyethylene up to a temperature at which it will flow, smooth out, and become a nonporous sheet. This temperature is of the order of 350° F. and is high enough to ignite the surface of the resin. At these temperatures, which vary a good deal during the flame-washing or finishing stage, a normal concrete surface produces enough water vapor pressure to explode the surface and thus prevent the successful application of a hot-melt coating or lining.

If the concrete surfaces are preheated to evaporate and drive off the water vapor, the concrete surface is degraded in two general ways. First, if enough heat is applied to remove the water vapor and carbonize the vegetable matter in the concrete, it also destroys the crystallized H_2O fraction of the portland cement molecule. This degrades the face of preheated concrete to the point where it spalls off and has no adhesion to the underlying concrete. Second, preheating is usually accomplished with open flame torches of one type or another. The application of an open flame to a concrete surface will deposit carbon, greasy soot, and other products of combustion on the face of the concrete. Flame-sprayed hot-melt polyethylene applied to such a surface does not develop enough adhesion to provide a good lining.

If, however, the face of portland cement concrete is properly protected, the process will actually add to its strength and resistance to heat. Such protection is provided by the application of a thin, glue-size solution of Synvaren PLS-A resin, made by Synvar Corp., Wilmington,

Del. This is the first step on *all* new clean porous surfaces, whether or not they produce vapor pressures at the surface when heated. All surfaces, both old or new, must be inspected and prepared to take care of three major problems—presence of foreign matter which will cause gassing and bubbling through the lining; adhesion; and shrinkage of hot-melt polyethylene.

Foreign matter such as loam, lime, plaster fragments, and similar materials can usually be removed from concrete by washing down with water and stiff brushes. Paint, oil, and similar materials should be burned to a cinder and then removed by wire brushing. It may be necessary to chip, sand-blast, or otherwise remove foreign matter from concrete surfaces. In any event, a hole-free polyethylene lining can not be produced on materials that form excess gas, without suitable preparation.

Sizing Concrete

The resin or glue sizing for concrete surfaces should be prepared as a water-alcohol solution having 30 to 35% solids and a pH of 6.5 to 7.5. A suitable hardner must be included just before spraying. The surfaces must be thoroughly soaked with the solution to insure complete penetration. Penetration into portland cement concrete results in the inclusion of the water of crystallization in the portland cement in the resin molecule. As the resin glue size polymerizes at room temperature within a few hours, the result is the substitution of the resin cement for the portland cement in the first few sand-gravel layers of the concrete surface. Tests have established that this penetration is usually of the order of 0.200 in. in depth. The polymerization is non-reversible and the resultant substituted resin cement, being a resorcinol-phenol-formaldehyde composition, will not degrade under flame-spraying or -washing.

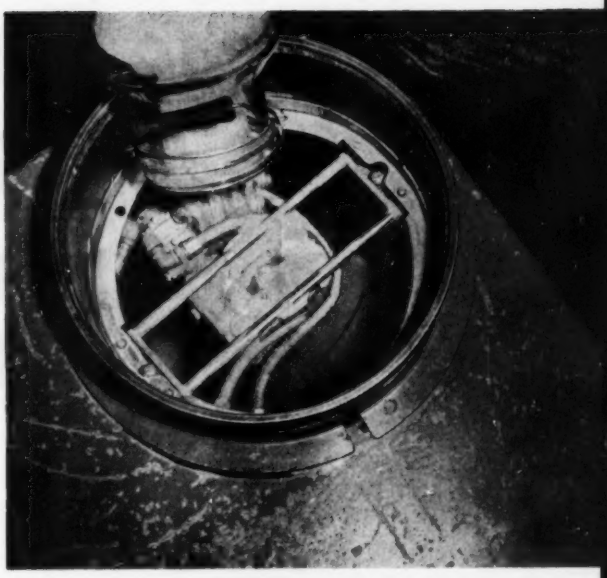
The application of glue size to other porous surfaces such as brick, tile, wood, etc., has the effect of establishing a good adhesive bond in depth. Some surfaces, such as wood, are thus protected against overheating and charring during subsequent flame-spraying operations.

Another and important factor in the use of resin sizing is the establishment of a compatible surface on which the following layer of resin glue is applied. The resorcinol-phenol-formaldehyde glue size is completely compatible with and forms an optimum adhesive bond with the phenol-formaldehyde-rubber cement or glue which is the next layer of the lining system. This cement must have satisfactory adhesion to both the sized surface above and the flame-sprayed layer which follows. Synvar RC-60 cement provides the best adhesive for use on either a glue sized porous surface, such as concrete, or a non-porous surface, such as steel.

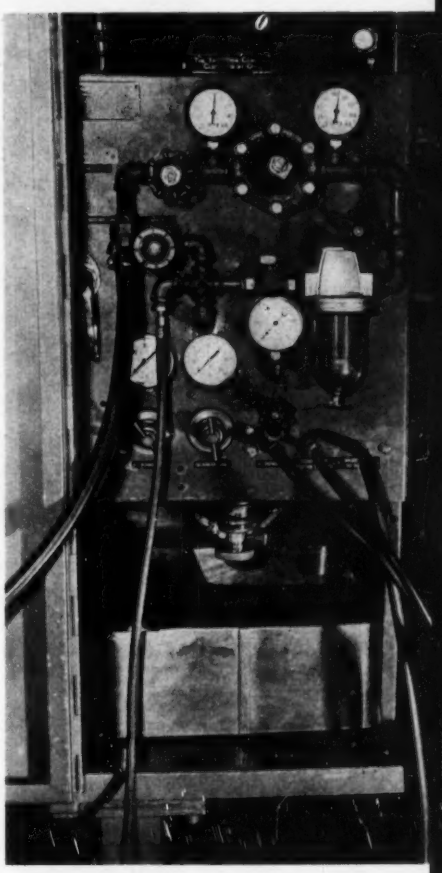
The cement is a liquid phenol-formaldehyde-rubber compound in which the resin content—the bulk of the solids—is a modified phenolic which polymerizes at the approximate temperature of thoroughly wet polyethylene. The phenolic resin is plasticized with rubber in a methyl-ethyl-ketone solvent and then modified with amyl-acetate. Since the resin is entirely compatible with amyl-acetate and acrylonitrile-butadiene rubber, the liquid resin may be modified for use with a brush or by spraying.

Elasticity of the cement or glue layer may be modified by the inclusion of more or less rubber. This layer sets up to a varnish-like hardness in its first stage after the solvents have evaporated. At this time it is ready for the first flame-sprayed polyethylene layer. The ce-

(*Continued on p. 122*)



Polyethylene used in flame spraying must be very finely powdered. Here, a load of such fine polyethylene is placed in material hopper prior to being flame-sprayed. After loading, hopper cover is clamped tightly in place, so that no leaks develop when pressure is applied to force powder through hose to spraying torch



Gages, valves, and piping of the flame-spraying equipment are all mounted in single cabinet. Knob above opening in sheet metal container below cabinet, when unscrewed, opens lower end of material hopper to permit speedy material change without loss of material being removed

Firestone ANNOUNCES A NEW HIGH IMPACT

RESIN

with optimum properties at minimum cost

EXON 872

Exon 872—the latest result of Firestone's laboratory development program—is a pure resin, composed of tough, rigid modified styrene alloy. This new resin has exceptional physical properties and costs less than resins of comparable quality.

Exon 872 can be easily compounded and processed—readily calendered, compression or transfer molded. Products made from **Exon 872** can be machined, sawed, drilled, tapped, turned, sanded and cemented. Calendered sheets can be embossed, polished, laminated and vacuum drawn in sheet or plate form. Colors can be blended directly into the formulation.

The combination of properties found in **Exon 872** makes it suitable for a wide variety of uses including hardware, electrical equipment, parts for automobiles, refrigerators, toys, radios and television sets.

For further information about **Exon 872**—or any member of the ever-growing Firestone line—write or call Chemical Sales Division.

EXON 872 CALENDERING AND LAMINATING TYPE

Average Physical Properties of Laminated Sheets*

Rockwell Hardness	R81	Izod Impact Strength, ft. lbs./in. Notched, ⅛" Bar	
Tensile Strength, psi	3400	+ 25°C.	5.0
Elongation, %	10 to 15	− 25°C.	2.8
Heat Distortion @ 66 psi, °C.	88 to 89	Specific Gravity	1.01
Flexural Modulus, psi	2.8×10^5		

*Physical properties were obtained by cutting the test specimens from laminated stock in such a manner that the length dimensions were parallel to the grain of the calendered stock.

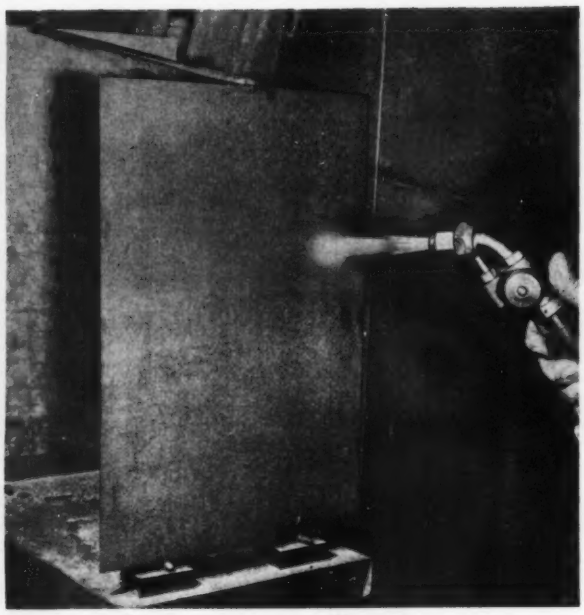
Processing Conditions:

Fusion Temp., °F.	280-300	Laminating Temp., °F.	355
Calendering Temp., °F.	340-350	Forming Temp., °F.	355

CHEMICAL SALES DIVISION

DEPT. 21B • FIRESTONE PLASTICS COMPANY, POTTSTOWN, PA.

1 Liquid phenol-formaldehyde-rubber cement is sprayed on previously cleaned sheet of steel with ordinary paint spray gun as first step in producing a flame-sprayed coating of polyethylene



2 After sprayed-on layer of phenol-formaldehyde-rubber cement has dried, an intermediate layer, composed of a mixture of polyethylene and silicone dioxide is flame-sprayed over it

ment may be applied when the glue size has been on for at least four hours. It should be applied as evenly and as heavily as possible to all surfaces to be lined; two coats are usually necessary to provide enough cement to hold the lining firmly in place.

Spraying the Polyethylene

Flame-spraying the first or intermediate layer of polyethylene is the critical step which determines the adhesion of the lining to the above size and cement layers. An adhesive bond must be established in both directions. The intermediate polyethylene composition used for this layer contains enough silicon dioxide to make a satisfactory adhesive bond to the cement in one direction and to the finish layer of pure polyethylene which follows. This intermediate layer may also be applied thick enough to supply desired heat insulation on concrete. It should be applied hot enough to obtain good coverage without excessive rebound and should consist of a cross coat obtained by a horizontal, then a diagonal, then a vertical, then an opposite diagonal pass of the torch. The area covered at one time should be not more than one yard square (9 sq. ft.), depending on the contours of the surface. This coating, when in place, should cover the cement evenly and completely. If there are thin areas, they should be evened up at once before proceeding to the next area.

At this stage, the coating should be about 0.040 in. thick. When the first coat has been flame-sprayed in place over the entire area, it should be immediately wet into the undercoat of cement. This is done with the Powder Weld torch set so that the compressed air of the shield flows over the coating after being heated by the oxygen-propane flame. No powdered material is being projected during this flame-washing operation. The operation is done rapidly, and the surface is heated sufficiently to bring the cement layer up into solution with the intermediate layer. In the process of wetting, the cement will turn a brown color and polymerize. As the polymerization of the cement is a non-reversible reaction, it is important that sufficient heat be applied. After the intermediate coat has been flame-washed, it should show considerable cement intermixed with it. It will also have shrunk in thickness to about 0.020 inch. All areas will also be quite hot and should be allowed to cool to room temperature before applying the next layer.

A second flame-sprayed layer is necessary on porous surfaces and at times a third layer is advisable. These layers are applied just as hot and are flame-washed the same as the first flame-sprayed layer. Each layer will add about 0.025 in. to the thickness of the lining. As polyethylene and its compositions will shrink as and after it cools to room temperature, it is necessary that a well designed shrinkage pattern is adhered to during flame-spraying and flame-washing. In order to allow for shrinkage and maintain maximum adhesion to all types of surfaces, the following shrinkage and spraying sequence has been devised:

A predetermined area is marked off with chalk into a checkerboard pattern with each square one yard or less in area. All fillets are marked off as 2-in. diagonals across the concave corners and 2 in. wide strips on convex corners. Each flat area is flame-sprayed and wet-in first, working always in alternate squares. The fill-in squares are sprayed and wet after the first squares have been shrunk in place and are cold. Each convex corner is sprayed and wet-in next and each

The Holiday Chest is a product of American Fabricated Products Co., Indianapolis, Ind. . . . molded by Fabricon Products, Inc., Plastics Division, River Rouge, Mich.

This HOLIDAY CHEST is creating a sales picnic . . . thanks to LAMINAC®

It's one of the latest in a fast-growing list of fast-selling products made of Cyanamid's LAMINAC polyester resin, reinforced with glass fiber . . . a handsome, lightweight, truly portable food chest for picnics, beach parties, hunting or fishing trips.

Molded in three pieces (top, bottom and side walls) in matched metal molds, the chest is 22″ x 14″ x 14″, comes equipped with stainless steel hardware, aluminum sliding tray and rubber sealing gasket, has a recessed drain for melted ice.

Because it's made of LAMINAC, the Holiday Chest is dent-proof. It's corrosion-resistant. It's light and easy to carry, yet holds 25 pounds of ice. It's seamless, can't leak. Its smooth exterior is easy to keep clean, won't snag clothing or scratch the finish or upholstery of a car. It will keep hot foods hot, as well as cold foods cold.

What's *your* new product idea? If it calls for a material with light weight, strength and corrosion-resistance *in superior degree*—with the right working properties, too—one of Cyanamid's LAMINAC polyester resins may be exactly what you want. Our application engineers will be glad to work with you—drop us a line.

LAMINAC® polyester resins
BEETLE® urea-formaldehyde molding materials
MELMAC® melamine-formaldehyde molding materials

made under rigid controls to American Cyanamid's high standards of quality

LAMINAC will be featured at Conference of SPI Reinforced Plastics Division—Feb. 3, 4, 5—Edgewater Beach Hotel, Chicago —among best examples of reinforced plastics applications. For complete information consult S.P.I., 67 W. 44 St., N. Y. 36, N. Y.

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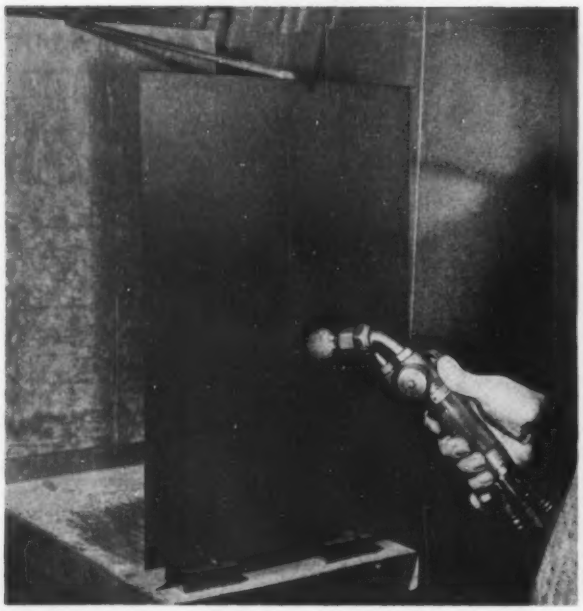
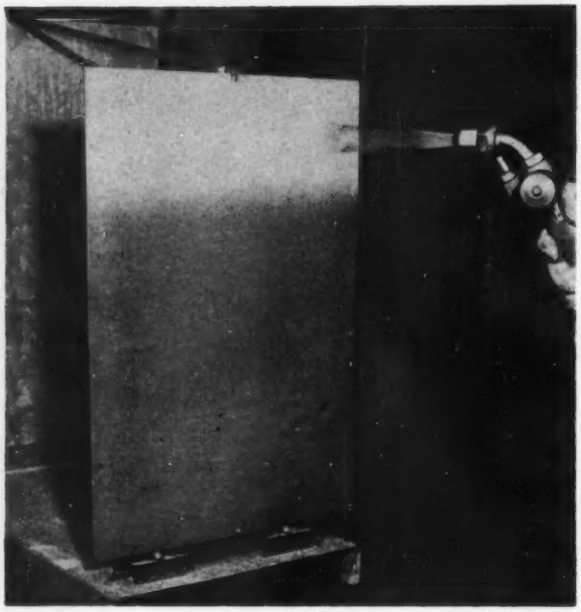
PLASTICS AND RESINS DIVISION
32 Rockefeller Plaza, New York 20, N. Y.

In Canada: NORTH AMERICAN CYANAMID LIMITED
Royal Bank Building, Toronto, Ontario
5550 Royalmount Avenue, Montreal, Quebec



3 Next, the entire sprayed area is flame-washed. This operation assures a good bond between the phenol-formaldehyde-rubber cement and the sprayed mixture of polyethylene and silicon dioxide



4 Finally, pure polyethylene is flame-sprayed on the surface of the intermediate layer to complete the coating operation. If more than one coat is applied, each must be flame-washed for good bond

Sections of steel sheet, coated with flame-sprayed polyethylene, and with edges bent at 45° angle, are fabricated into a box. Final assembly consists of bolting the coated sections together, then applying flame to sheet metal edges, and finally retightening nuts and bolts. Application of heat produces a water-tight bond between adjoining polyethylene surfaces. Module construction allows various sizes of containers to be quickly constructed with this type of assembly operation

concave corner is done last. Each succeeding layer should be so laid out that the outline of the squares overlaps the preceding outline in a crossed pattern. If each layer is sprayed hot and the shrinkage is allowed to occur as above, little trouble will be had with over-all shrinkage.

The first and all following pure polyethylene layers are now flame-sprayed in place. The first polyethylene layer is pigmented if desired, since pure polyethylene flame-sprayed with the Powder Weld torch contains no inclusions, has not been degraded, and retains the translucent white color of the original resin. Spraying is again done by the cross coat method described before. The material is sprayed as hot as possible without degrading the resin; the hotter the coating, the less shrinkage will occur, as and after the layer is wet into the under coat. This layer is also sprayed and shrunk in place in accordance with the carefully marked out shrinkage pattern. After the application of the first pure polyethylene layer, the total thickness of all layers should be about 0.125 inch. Subsequent flame-washing will reduce this to about 0.100 inch. If a well designed shrinkage pattern is adhered to in the flame-spraying and flame-washing, successive layers may be added and patching done at will.

Polyethylene on Steel

Lining or coating steel and all other non-porous surfaces is done in the same way as on concrete.

Non-porous surfaces, however, do not need the glue size and the first step is to thoroughly clean them. They can usually be washed down with a solvent, flame-descaled, scraped, and otherwise cleaned and dried. It is not necessary to sand-blast, unless other methods of cleaning fail. Hard rust can usually be fixed with Totrust made by The Wilbur & Williams Co., Boston, Mass., or similar material. The important consideration is the removal of any foreign matter that will produce a gas when heated. After cleaning, the resin cement is applied as on concrete. One composition flame-sprayed intermediate layer is sufficient to provide a good adhesive bond and the finish layer of pure polyethylene is then flame-sprayed to complete the lining.

The Powder Weld apparatus, processes, and linings just described are fully covered by United States and foreign patents, which are available for license.

UNIQUE sash balance housing

Modern spring-control sash balances are now housed in slender tubes extruded from Tenite butyrate.

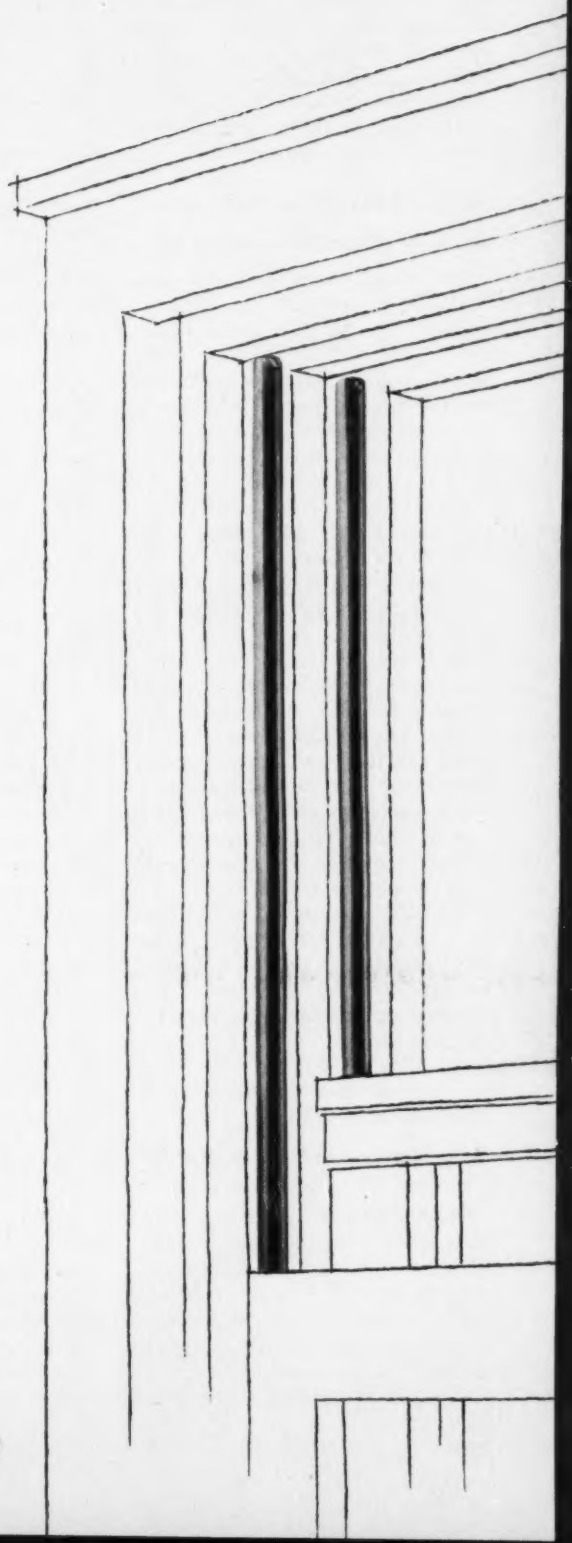
The trim Tenite sheaths not only protect the spring mechanisms from dust and dirt, but also give the balances a permanently lustrous surface which will not corrode or peel under long use. They add practically no weight to the balance assemblies — help make handling and installation easy.

Tough, high-impact-resistant Tenite housings and parts are a regular feature today of many familiar appliances, tools, and instruments. Rapidly formed by injection molding or continuous extrusion, Tenite often leads to improved product appearance and performance — with savings in manufacturing and assembly costs.

For more information about the properties and many uses of this tough material, write to EASTMAN CHEMICAL PRODUCTS, INC., KINGSPORT, TENNESSEE, subsidiary of Eastman Kodak Company.

Information on Tenite is also obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Houston, Leominster (Mass.), Los Angeles, New York, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, Seattle, and Toronto; and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

TENITE
BUTYRATE
an Eastman plastic



Sash balances manufactured by Unique Balance Co., Inc., New York City; Tenite butyrate housing developed and extruded by Keystone Plastics, Inc., Union, N. J.

S.P.E. Technical Conference

THEME of the Tenth Annual Technical Conference of the Society of the Plastics Engineers, Inc., held at the Royal York Hotel, Toronto, Canada, Jan. 27 through 29, was: "Plastics International." Dr. Emmett O'Grady, who first attracted national attention for his wit and wisdom while lecturing at Ottawa University, was Banquet Speaker.

Available abstracts of papers given at this conference follow:

Styrene-Acrylonitrile Copolymers

Dr. J. S. Whittaker—Bakelite Co.

Acrylonitrile can be copolymerized with styrene to give rigid, transparent materials that are substantially different from either polyacrylonitrile or polystyrene. The copolymers have higher mechanical strengths, better weather resistance, and different chemical properties than polystyrene. They can be readily molded or extruded and in this respect they differ from polyacrylonitrile. Incompatibility of the copolymers with polyacrylonitrile or polystyrene is further evidence of a true copolymer.

Resistance of commercial copolymers to foods, detergents, household cleaning solvents, oils, greases, low benzol content gasolines, battery acids, alkalies, and some cosmetics indicates a wide area of usefulness. Many copolymer applications require one or more of these chemical resistant properties plus the inherent toughness of the material.

Oriented copolymers, in the form of stretched monofilaments, exhibit the same improved mechanical strength, heat resistance, and weather resistance as molded copolymer shapes.

Techniques and Applications of Modified Styrene Sheet

F. J. MacRae and W. D. Harris—The Dow Chemical Co.

The introduction of modified styrene in sheet form has established a whole new field of plastics fabrication. Rapid growth of this field was made possible by the outstanding properties and realistic price of modified styrene sheet.

The bulk of modified styrene sheet is fabricated by the vacuum forming process. The sheet, clamped in a frame and softened by heat, is pulled over a male mold or into a female mold of the desired shape. A blanking or trimming operation completes the fabrication of the part. The vacuum forming process may also be applied to continuously extruded hot sheet.

The relatively low initial cost of fabricating equipment and the very low cost of making vacuum forming molds from a number of materials such as Kirksite, aluminum, Meanite, and thermosetting plastics make this field of fabrication attractive for many uses. The refrigeration and television industries are large consumers of modified styrene sheet.

Research for new, more versatile sheet materials and the introduction of new fabricating equipment and techniques will continue to stimulate the growth of the plastics sheet fabricating field.

Applications for Rubber Modified Styrene Molding Compounds

E. V. Hellyer—Monsanto Chemical Co.

First used in the novelty field, primarily because of their low cost, styrene molding compounds are now recognized in industry as engineering materials, selected for their own inherent properties.

The introduction of rubber modified styrene molding materials approximately five years ago has resulted in over-all expansion of the total styrene market. The modified styrenes possess many of the desirable properties of the general purpose materials, such as excellent dimensional stability, low specific gravity, uniform physical properties, and ease of moldability. In addition, they possess strength characteristics necessary in many applications.

Rubber modified styrenes are widely used in industrial applications such as refrigeration, air conditioning, and automotive battery cases. They are also rapidly replacing general purpose styrene in housewares and toys. It is essential that consumer resistance to plastic toys be overcome by the use of impact materials if the industry is to successfully counteract inroads currently being made by metals in this field.

Development of large injection molding equipment has contributed much to the growth of rubber modified styrenes. Extrusion of high impact sheeting for vacuum forming offers a tremendous field.

Hand in hand with new developments and equipment, new and improved rubber modified materials are being developed by the raw material manufacturers. We look for sales in impact styrenes to more than double over the next five year period, representing over 50% of total industry sales of all types of styrene molding materials.

Extrusion of Thermoplastic Film and Sheeting

George P. Kovach—Foster, Grant Co., Inc.

Various methods for the forming of thermoplastics into film and sheeting were discussed and the advantages of extrusion over other methods were pointed out. The difference in investment and manufacturing time between the extrusion of cellulose acetate sheet and its manufacture by the old block method was shown.

Reasons for the fast expansion of film extrusion were given as:

1) The growth of polyethylene packaging film; 2) Demand for styrene sheeting for vacuum forming.

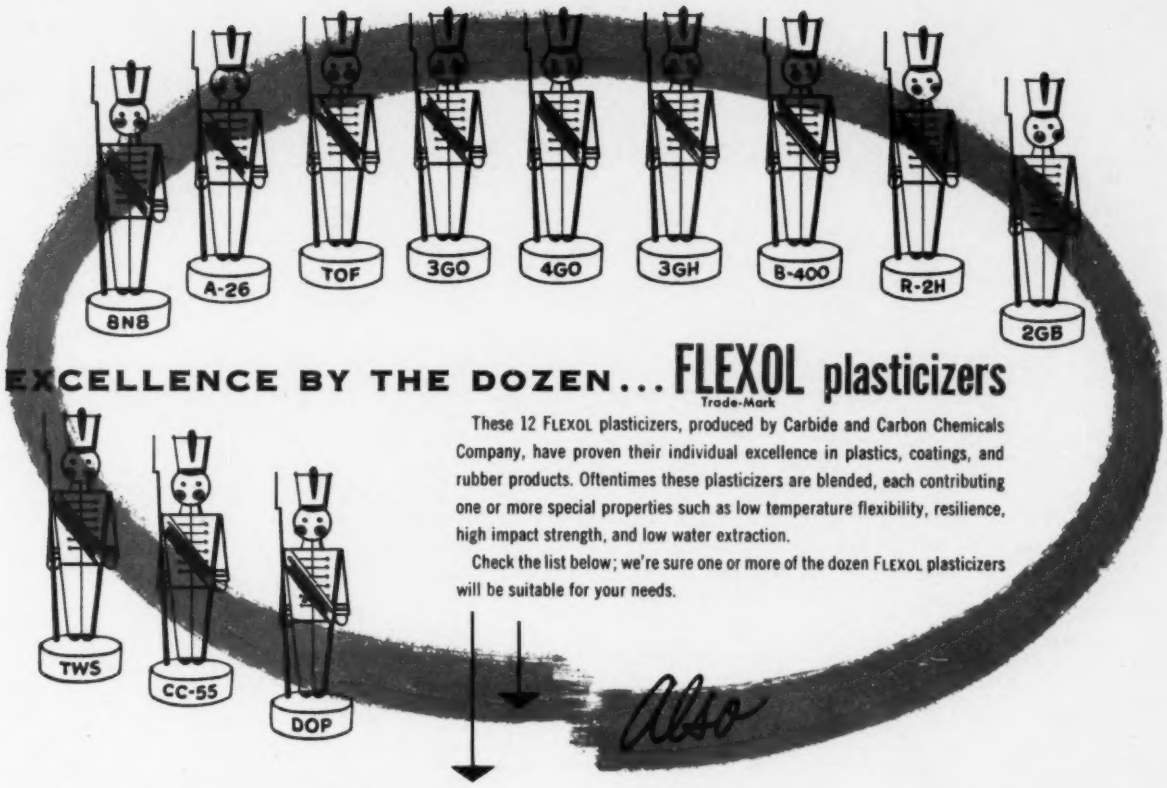
The newest addition to the extruded film family is plasticized P.V.C. The advantages of extruded P.V.C. film over calendered film were shown.

The various methods and techniques of film extrusion were discussed, dividing the field first into: a) rigid sheeting; and b) flexible film and sheeting.

Various factors influencing the rigid sheet extrusion were discussed: a) preparation of stock; b) screw design and heating method; c) die design; d) take-off methods.

The extrusion of polyethylene film was described in detail as was also the extrusion of plasticized P.V.C., including both flat film extrusion and circular blow extrusion.

Slides were presented showing circular and flat film dies, extrusion



EXCELLENCE BY THE DOZEN... FLEXOL plasticizers

Trade-Mark

These 12 FLEXOL plasticizers, produced by Carbide and Carbon Chemicals Company, have proven their individual excellence in plastics, coatings, and rubber products. Oftentimes these plasticizers are blended, each contributing one or more special properties such as low temperature flexibility, resilience, high impact strength, and low water extraction.

Check the list below; we're sure one or more of the dozen FLEXOL plasticizers will be suitable for your needs.

general purpose primary plasticizers

FLEXOL DOP
[di(2-ethylhexyl) phthalate]—The "Top Kick" plasticizer for vinyl chloride resins.

FLEXOL CC-55
[di(2-ethylhexyl) hexahydrophthalate] for low viscosity plastisols—Improved low temperature properties.

FLEXOL TWS
(tetrabutyl thiodisuccinate)—An unusually non-volatile monomeric plasticizer.

FLEXOL 8N8
[2,2′,(2-ethylhexamido) diethyl di(2-ethylhexoate)] — A vinyl resin plasticizer with very low volatility.

for low-temperature flexibility

FLEXOL A-26
[di(2-ethylhexyl) adipate]—Low viscosity plastisols with excellent viscosity stability.

FLEXOL TOF
[tri(2-ethylhexyl) phosphate]—The outstanding low temperature plasticizer . . . with flame resistance too.

FLEXOL 3GO
[triethylene glycol di(ethylhexoate)]—Low temperature plasticizer for neoprene and other synthetic rubbers.

FLEXOL 4GO
[polyethylene glycol di(2-ethylhexoate)]—an excellent nitrocellulose lacquer plasticizer at moderate cost.

FLEXOL 3GH
[triethylene glycol di(2-ethylbutyrate)]—The outstanding plasticizer for polyvinyl butyral.

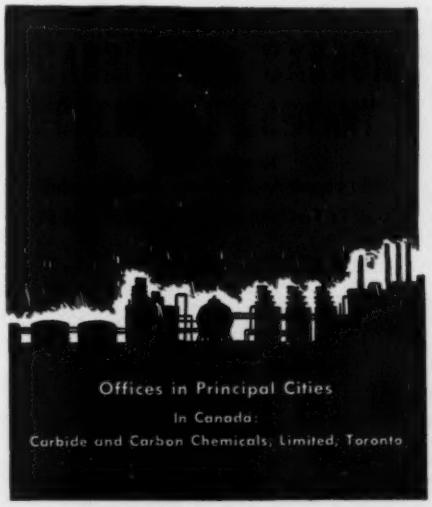
FLEXOL B-400
(Polyalkylene derivative) — A nitrocellulose plasticizer which is neither an oil nor an ester.

FLEXOL R-2H
(polyester)—A non-migrating, extraction resistant polymer with good electrical properties.

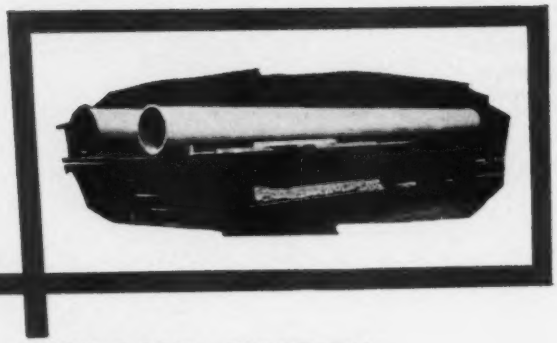
FLEXOL 2GB
(diethylene glycol dibenzoate)—High solvating action on vinyl chloride resins.

For more information on plasticizers, write for your copy of "FLEXOL Plasticizers," (F-5882). In Canada: Carbide and Carbon Chemicals, Limited, Toronto.

"Flexol" is the trade-mark for Union Carbide's family of plasticizers.



"Pla-Tank" Products are manufactured by
The Chemical Corporation, Springfield 9, Mass.



STACKS, DUCTS, HOODS AND PIPES

of reinforced plastic combine strength, light weight, and chemical resistance

Reinforced plastics produced from glass fibers bonded with BAKELITE Polyester Resins form the 40-foot long fume duct shown on the flatcar above and the 77-foot fume vent stack illustrated at the left.

Reinforced plastic structures combine high mechanical strength with light weight. They are easily handled and quickly assembled, usually without special rigging. They often eliminate heavy reinforcing of the base when mounted on roof framing. They won't rust, and their resistance to weathering and chemical attack reduces maintenance costs.

Other structures, such as pipes, ducts, hoods, and tanks are also produced from reinforced plastics made with BAKELITE Polyester Resins. According to the manufacturer, the pipe can carry corrosive liquids under moderate pressures. Pipe sections can be joined right in the field by "paint brush" welding—wrapping resin-soaked glass fiber mats around joints and curing them. Ducts and hoods have a one-piece molded construction that prevents leaks. Tanks are made in a great variety of standard and custom sizes for electroplating purposes.

To learn more about these large-scale reinforced plastic structures, and about the BAKELITE Polyester Resins that make them possible, write Dept. SY-13.

BAKELITE
TRADE-MARK
POLYESTER RESINS

TRADE MARK

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of blown film, including the take-off mechanism, and tables showing a comparison of some physical properties of calendered and extruded P.V.C. film.

Why More Plastics

A. Renfrew—Plastics Div., Imperial Chemical Industries Ltd., London, England.

Plastics at present in common use suffer from many disadvantages. The upper temperature at which they can be used is low and few will withstand 250° F. Most plastics are nonductile and cannot yet be manipulated as easily or as quickly as metals, although great strides have recently been made on the engineering side of the industry. Many plastics have poor weather resistance.

In the immediate future, very large tonnages of well known plastics such as polystyrene and polyethylene will be required, so there is no commercial pessimism.

Growing industries will present new problems which only plastics can solve. The fibers industry has already been given "Terylene" and polyacrylonitrile, and the aircraft industry is using several unusual plastics. The electronics industry is always seeking new products for its highly specialized applications.

It is true that Beilstein has not been mined completely nor have the speculations of Staudinger or Carruthers been fully exploited. New and commercially important plastics may therefore arise from developments along familiar lines but there seem to be no revolutionary technical thoughts.

There is undoubtedly a need, however, for new plastics. The present trouble of the chemist is to imagine how these needs may be fulfilled.

Future Growth of the Plastics Industry Both in Size and Technical Quality

Harry A. Gadd—Canadian General Electric Co. Ltd.

Synthetic plastics is a growth industry. Included, as it usually is, with chemicals, it is also a member of a growth family. Curves showing plastics history indicate a growth of 15% annually over the last 25 years, and 20% per year over the last 17 years. Growth was continued through the depression period from $50 million in 1930 to 90 million in 1935 and 180 million in 1940.

Raymond H. Ewell, Stanford Research Institute, has projected the historic record conservatively to show an increase over the next 22 years from 800 millions in 1950 to 8 billions in 1975, an annual average increase of just less than 10%, based on 1950 values. Mr. Ewell's approach appears conservative because, if the growth of the past 25 years were projected directly, the 1975 figures would be 26 billions.

Plastics materials development and manufacture is generally scientific. Application and fabrication by molders and processors is still largely in the art class and deplorably lacking in science. Fractional progress has been made, but the history of other industries shows that maturity and success are linked with scientific control and achievement.

Industrial Interests in Education of Plastics Engineers

R. C. Bartlett—Natvar Corp.

During the past year, opinions of industry on the Society of Plastics Engineers' educational program have been acquired by means of a questionnaire. Answers received cover the plastics industry in a broad point of view. The plastics industry strongly favors the present S.P.E. program for education of plastics engineers. In addition to the information requested in this questionnaire, other helpful facts have been uncovered by statistical analysis of the answers. This survey demonstrates the industrial interest in plastics engineers and may aid the educators in tailoring their curricula.

Marking and Decorating of Plastics

Arthur N. Skeels—Art Roll Leaf Stamping Co.

Nearly all the methods of decorating and marking of all types of plastics were outlined. These included hot stamping, silk screening, offset printing, filling-in, mask spraying, paper labels, decals, and engraving.

One of the main highlights of the talk was directed to the mold design engineer, who was told what to look for prior to the actual making of the mold so that costs for decorating can be held to a minimum. This involves proper thinking about the design of the product in the initial stage to avoid many of the pitfalls that can befall the decorating or marking of the product. Some helpful hints as to what to look for in this respect, and for the improvement of the appearance of the product from the standpoint of the general buying public, were also given.

Plastics Material Problems in Power Distribution

B. Kellam—Hydro Electric Power Commission of Ontario

Activities in plastics of one of the largest electrical utilities on the continent were outlined and details of three projects were given to illustrate the problems and attempts to solve them. The first was the development of a plastic cable-fastener for supporting vinyl-insulated control cables in a vertical position. The stages in the development and the results of tests simulating operating conditions with long vertical cables suspended on them were given. The second involved experiences with polyethylene as wire insulation used in a large 4000-v. network. Failures at joints and some due to environmental cracking were detailed, with results of improvement in technique and materials. Finally, plastics pipe was dealt with, for water supply, electrical conduit, and a special application in high-voltage power transmission. Some of the factors involved in the evaluation of plastics pipe for these uses were also given.

Polyester Resins and Their Industrial Applications

Dr. Irving E. Muskat—Celanese Corp. of America, Marco Products Dept.

Synthetic resins and plastics materials are usually classified as: 1) naturally occurring high molecular weight materials; 2) thermoplastic resins; and 3) thermosetting resins. Classes 2 and 3 are further divided into those resins which are cured by condensation reactions and those cured by polymerization reactions.

Polyester resins, often called "low pressure" or "contact pressure" resins, belong in the group of polymerizable thermosetting resins. They give off no volatile by-products and no pressure is required in curing. The two types of polyester resins which are commercially available

(*Continued on p. 201*)

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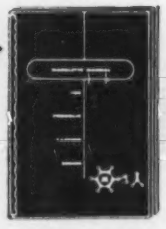

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PLASTICS*
TECHNICAL SECTION: Dr. Gordon M. Kline, Technical Editor

Frictional Properties of Plastics

Behavior of Polyethylene, Polytetrafluoroethylene, and Halogenated Derivatives

by R. C. Bowers,† W. C. Clinton,† and W. A. Zisman†

The static and kinetic frictional properties of a group of unplasticized linear high polymers and copolymers have been investigated in a Bowden-Leben "stick-slip" machine. These plastics were derivatives of polyethylene containing various proportions of fluorine or chlorine. Friction measurements were made for steel sliding on polymer, polymer on polymer, and polymer on steel, with two types of polymer surfaces, polished and abraded. The results showed that the substitution of chlorine for hydrogen in polyethylene caused an increase in friction, and that the substitution of fluorine caused a decrease. The effect of chlorine was found to predominate when both fluorine and chlorine were substituted.

The major component of the frictional force for each plastic, except for polytetrafluoroethylene, is believed to be the force required to shear the bulk plastic. Transfer of plastic occurs for some sliding combinations, and the orientation of the transferred material during sliding indicates that the possibility of some shearing at the plastic-metal interface cannot be discounted. The uniquely low coefficient of friction for polytetrafluoroethylene is shown to be good evidence that for this plastic, shearing in depth must be only a minor component of the frictional force.

The frictional measurements of thin films of the polymers on steel showed that the frictional force was always much less than for a bulk piece. A good approximation of the static coefficient of friction (μ_s) for very thin films could be calculated by multiplying μ_s for the bulk plastic by the ratio of the yield pressure of the plastic to the yield pressure of the substrate.

The ease of material transfer combined with low shear strength are confined to polyethylene and polytetrafluoroethylene. The additional properties of low adhesion and heat stability make the latter more suitable for many applications of dry lubricants.

FRICTION and wear studies of polytetrafluoroethylene, polyethylene, and polyvinyl chloride have been published recently by Shooter and Thomas (1)[1] and Shooter and Tabor (2). Besides the corroboration of their work, we report here data on other plastics, some new generalizations about the relation of chemical constitution to friction, and information on the lubricating properties of thin films of plastics.

The frictional force between a ball slider and a plate of the plastic under study was measured with a modification of the well known Bowden-Leben "stick-slip" machine (3-Ch. IV). In Fig. 1, p. 132, is a nonscalar drawing of the essential components of our machine, which was built around a Brown and Sharpe No. 5 surface grinder having both the cross feed and the longitudinal movement of the table driven hydraulically. The hydraulic pump had been removed from the interior of the machine to a distance of 15 ft. so that pump vibrations could be sufficiently damped through the long pressure lines.

The lower test specimen B is screwed to the table P, which is hydraulically driven at a uniform velocity. To apply the load, the upper ball-shaped specimen A attached to the frame E is lowered with the weight G in the position shown until it just makes contact with the plate-shaped specimen of platen B. Upon removing the weight, the restoring force in the flat steel spring S causes the two specimens to be pressed together with a force equal to the weight G. The light beam H is reflected from the mirror J attached to the bifilar suspension, and is focused on a modified oscilloscope-type magazine camera located 675 cm. from the mirror. A tangential force of 150 g. will deflect the light beam 1 cm. on the camera. Frictional measurements were made between combinations of steel-on-plastic, plastic-on-steel, and plastic-on-plastic at 25° C. with a constant sliding velocity of 0.01 cm. per second.

Materials

Chemical names, structural formulas, sources, molding conditions, and hardness of the polymers tested are listed in Table I, p. 135. Compositions of the series of copolymers made of chlorotrifluoroethylene monomers and tetrafluoroethylene monomers (6) as well as the copolymer of the latter with ethylene (7) are expressed in mole percent of the two monomers. These copolymers were available only as thin translucent sheets approximately 0.050 in. thick. The 50-50 copolymer of tetrafluoroethylene and ethylene was molded as flat plates ⅛ in. thick. Polyvinyl fluoride was obtainable only as a thin translucent sheet approximately 0.0025 in. thick. Because of the dimensions and forms of the above plastics, the study of their frictional properties was limited to that of steel sliding on the plastic. Speci-

*Reg. U. S. Pat. Off.
†Surface Chemistry Branch, Chemistry Div., Naval Research Lab., Washington 25, D. C.
[1]Numbers in parentheses link to references at end of article.

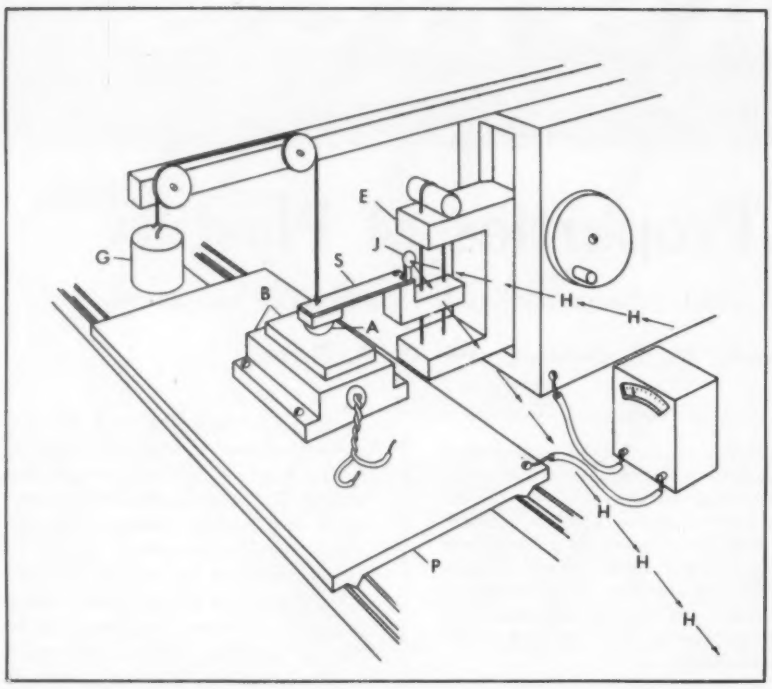

Fig. 1—Basic elements of friction-measuring apparatus; parts are identified in text

mens of unplasticized polyvinyl chloride, polyvinylidene chloride, and polyethylene were molded from their powders as transparent and nearly colorless disk 2.8 cm. in diameter and 0.5 cm. thick and as hemispherical specimens ½ in. in diameter. Test specimens of polytrifluorochloroethylene and polytetrafluoroethylene were made from the bulk plastic in the shape of flat plates and hemispheres by milling or by turning in a lathe.

Two types of polymer surfaces were used, abraded and heat-cast. The first type was prepared by abrading the plastic under water in a rotary manner with 600A grit "Wetordry Waterproof Tri-m-ite" silicon carbided paper, and the second type by pressing the plastic for a short time against a highly polished, flat nickel disk held at a temperature above the polymer softening point. While being quickly cooled to 25° C., the metal disk and plastic were kept under an external pressure of 2000 p.s.i. Examination of these surfaces with a Shore Scleroscope showed that they were softer than the abraded surfaces; because of the quick cooling they may have been amorphous.

Polytrifluorochloroethylene (T.F.C.E.), polytetrafluoroethylene (T.F.E.), and their copolymers were cleaned in a boiling 1:2 nitric-sulfuric acid mixture, then rinsed in three successive changes of boiling distilled water (4, 5) and dried in a desiccator. They were also cleaned by abrasion under water with 600A grit Wetordry paper, rinsed in distilled water, and dried as before. In a third method, the material, after abrasion under water, was cleaned with a concentrated solution of a detergent (Tide), then washed with plenty of distilled water, and finally dried in a desiccator. The frictional measurements after each method of cleaning were the same. Since some of the plastics would be attacked by oxidizing acids, only the last two methods could be used for cleaning them. Identical frictional measurements resulted from using these two methods of cleaning plastics. Therefore, in the majority of the measurements made, the third method was used.

Flat steel plates or platens and spherical steel sliders were all made from low-carbon steel hardened to Rockwell C10-12, except those 6.35 mm. and 12.7 mm. in diameter, which were commercial balls hardened to Rockwell C62-63. The platens were cleaned by lapping each under water with 600A grit Wetordry paper and wiped on grease-free filter paper to remove any grit; then each was washed with a detergent (Tide) to remove any cellulose fibers, rinsed with freshly distilled water, and finally dried with C.P. acetone. The steel sliders were boiled in C.P. benzene; and, just prior to being used, were polished with Behr-Manning 4/0 emery polishing paper.

Thin adherent films of T.F.E. were prepared both on steel and on brass plates by using a commercial T.F.E. suspensoid in water. A freshly cleaned steel surface was coated with the suspension by spraying or dipping, was allowed to dry, and then was fused either for 3 to 4 min. at 700° F., in an electric oven or for a few sec. in a radio-frequency induction heater with a frequency of 400 kilocycles. No difficulty was encountered in preparing remarkably smooth and uniform films. The thickness of the film deposited could be decreased by diluting the suspensoid with distilled water, and film thicknesses of 0.0005 in. to a tenth of that were readily prepared.

Friction Measurements

It is well known that the Bowden-Leben friction and wear machine will develop a characteristic relaxation oscillation or "stick-slip" motion when the coefficient of kinetic friction μ_k is much less than the coefficient of static friction μ_s. Incidence of "stick-slip" is dependent on the friction-velocity relation as well as on the natural frequency, inertia, and damping of the vibrating parts of the machine (8,9,3-Chapter V). For a given coefficient of friction, the amplitude of "stick-slip" vibration increases with the load applied to the rubbing surfaces, while for a given load, the amplitude increases with the coefficient of friction. Bowden and Tabor (3-Chapter XIV) have shown that rubbing surfaces having large coefficients of friction are damaged or worn largely because the adhesion of contacting asperities of the two surfaces is followed by their tearing or shearing. Under extreme conditions of surface damage, these two processes may coincide with the incidence of the "stick" and of the "slip," respectively. Therefore it is usual to supplement the data obtained with

Samson Chairs by Shwayder Bros., Inc. Col-O-Vin vinyl upholstery of Marvinol resin by Columbus Coated Fabrics Corp.

"Strong enough to stand on!"

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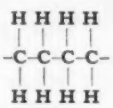
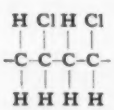
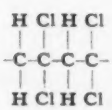
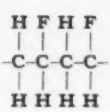
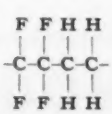
this machine by preparing photomicrographs of the damaged surface of the ball and of the wear path after a single traverse.

Although the lower specimen may be kept moving at a constant velocity with respect to a fixed point on the apparatus, the relative velocity between the two rubbing surfaces becomes zero during the "stick." Thus, a series of static values may be measured during sliding. Of course, only one value of μ_s can be reported for plastics which slide freely without "stick-slip."

Measured coefficients of friction are given in Tables II and III, p. 136, for both abraded and polished surfaces. It was impractical to abrade or polish further the thin sheets of fluorinated copolymers; hence, the results reported are for those surfaces as prepared by the manufacturer.

Table I—Description and Sources of Polymers Tested

Polymer (unplasticized)	*Structural formula*	*Hardness*[a]	*Molding temp.*	*Molding pressure*
			°F.	*p.s.i.*
Polyethylene[b] M. W. 23,000		46	250-275	2000
Polyvinyl chloride[c] M. W. 85,000		71	300-325	2000
Polyvinylidene[d] chloride		64	250	2000
Polytrifluorochloro-ethylene (TFCE)[e]		77	450	2000
Polytetrafluoro-ethylene (TFE)[f]		30		
Polyvinyl fluoride		—	—	—
TFE-TFCE copolymers[f]	*Mole Percent* TFE / TFCE 98 / 2 90 / 10 80 / 20 60 / 40 10 / 90	—	—	—
TFE-Polyethylene copolymer[f] (50-50 Mole %) M. W. 25,000		—	—	—

[a]Shore Scleroscope hardness (for abraded surfaces). [b]Bakelite Div., Union Carbide and Carbon Corp. [c]The B. F. Goodrich Chemical Co. [d]The Dow Chemical Co. [e]The M. W. Kellogg Co. [f]E. I. du Pont de Nemours and Co., Polychemicals Dept.

Variations in the kinetic coefficient of friction μ_k with distance of travel are indicated by the range of values given in Table III for the polymers which did not show intermittent motion. Thus, μ_k for polyethylene decreased from a maximum value of 0.33 to a constant value of 0.25 when steel slid on the abraded polymer, and it decreased from a maximum value of 0.60 to a constant value of 0.50 on the polished polymer.

Specimens of T.F.E., polyethylene, T.F.C.E., polyvinyl chloride, and polyvinylidene chloride were each subjected to a series of friction measurements in which the ball diameter was varied between 6.35 and 50.7 mm., and the load was varied from 0.2 to 1.5 kilograms. It was found that for each polymer F/W (ratio of frictional force F and load W) was constant. Hence, Amonton's law is obeyed over the load range employed, so that the coefficient of friction μ_k is independent of the load.

Friction measurements on polyvinyl fluoride could be made only for steel sliding on plastic. It was observed that μ_k decreased from 0.30 to the constant value of 0.10. For steel sliding on T.F.E. μ_k decreased from 0.10 to approximately 0.04 with an abraded surface and from 0.15 to 0.08 with a polished surface. T.F.E. sliding on steel exhibited a decrease in μ_k from 0.10 to a constant value of 0.04. It remained constant at 0.04 as abraded T.F.E. slid against abraded T.F.E. The coefficient of friction of steel sliding on the abraded 50-50 copolymer of T.F.E. and polyethylene were nearly identical with those found for polyethylene, i.e., μ_k decreased from a value of 0.33 to approximately 0.25.

In Fig. 2, p. 136, μ_s and μ_k for steel sliding on each of series of T.F.E.-T.F.C.E. copolymers are plotted against the percent of chlorine atoms replacing flourine. Both coefficients of friction rise with the chlorine content and especially with the first 10 percent. A nearly constant value of μ_k is reached after the steel ball has traversed a distance of 1 cm., and it is this value of μ_k which is plotted on the lower curve. "Stick-slip" motion did not occur on copolymers containing 10% of chlorine, but did occur with 20 percent. Consequently, the value of μ_k shown

Table II—Static Coefficient of Friction (μ_s) of Some High Polymers[a]

Polymer	*Steel sliding on polymer* Polished	Abraded	*Polymer sliding on steel* Polished	Abraded	*Polymer sliding on polymer* Polished	Abraded
Polyethylene	0.60	0.33	0.60	0.33	0.60	0.33
Polyvinyl chloride	0.90–0.70	0.45	0.45–0.60	0.45–0.50	0.60–0.90	0.45–0.55
Polyvinylidene chloride	1.8 –1.0	0.68	1.4 –1.6	0.70–0.95	1.3 –2.0	0.80–0.95
Polyethylene	0.60	0.33	0.60	0.33	0.60	0.33
Polyvinyl fluoride	0.30	—	—	—	—	—
50–50 copolymer of TFE–polyethylene	—	0.33	—	—	—	—
Polytetrafluoroethylene	0.15	0.10	—	0.10	—	0.04

[a] Measured at 0.8-kg. normal load and with a 12.7-mm. diameter slider. Two values are given when "stick-slips" occur; first, the initial value of μ_s and second, the value measured after the ball has travelled 2 centimeters.

Table III—Kinetic Coefficient of Friction (μ_k) of High Polymers Free From "Stick-Slip" Behavior[a]

Polymer	*Steel sliding on polymer* Polished	Abraded	*Polymer sliding on steel* Polished	Abraded	*Polymer sliding on polymer* Polished	Abraded
Polyethylene	0.60–0.50	0.33–0.25	0.60	0.33	0.60	0.33
Polyvinyl fluoride	0.30–0.10	—	—	—	—	—
50–50 copolymer TFE-polyethylene	—	0.33–0.25	—	—	—	—
TFE	0.15–0.08	0.10–0.04	—	0.10–0.04	—	0.04

[a] Measured at 0.8-kg. normal load and with a 12.7-mm. diameter slider.

for the latter materials was estimated in the usual way as being one-half the sum of the "stick" and the "slip" values.

Steel on Class I Plastics

It is convenient in presenting the remaining data to divide the plastics studied into two classes: Class I, which is made up of those that did not "stick-slip," and Class II, all the other plastics.

During the sliding of the steel on the Class I plastics μ always decreased, attaining a constant value after traversing approximately 1 or 2 centimeters. A typical example is steel sliding on abraded polyethylene (Fig. 3, p. 138). The most evident explanations are that either the real area of contact was decreasing, or else a film of the polymer was being transferred to the sliding ball. The first explanation is not plausible, because the width of the track did not vary along the track length.

In another experiment, after the first traverse of the ball on the plastic, the ball slider, without being cleaned, was promptly made to traverse a new area of the plastic, and μ_k was found to remain the same as the value of 0.25 found at the end of the first traverse. This would be expected if a film of polyethylene were transferred to the steel ball during the first traverse. If this is so, it would be expected that the behavior of the sliding combination in the second traverse would simulate that of polyethylene sliding on polyethylene. But when bulk polymer was rubbed on bulk polymer, μ_k was 0.33 instead of 0.25. From this it would appear that the frictional properties of the transferred film differed in some way from those of the bulk material; presumably, the transferred film was oriented. If this is true, μ_k must be lowered by 0.08 when the polymer molecules become oriented in the plan of sliding.

Similar experiments were conducted with a steel ball sliding in one direction on an abraded T.F.E. platen, and the results were similar to those obtained with polyethylene. The value of μ_k decreased during only the first 0.1 cm. of traversed path to attain a constant value of 0.04, and this also equalled μ_k for the bulk plastic sliding on bulk plastic. When a second traverse was made on a clean area without cleaning the slider, μ_k remained constant at 0.04; hence, transfer of T.F.E. to the steel ball had occurred in the first traverse. These experiments could not similarly give information on the orientation of the T.F.E. coating on the ball because here the observed constant value of 0.04 also happens to be identical with the value of μ_k for bulk T.F.E. sliding on bulk T.F.E.

Coefficients of static friction were always much higher when plastics of Class I were "heat-polished," the

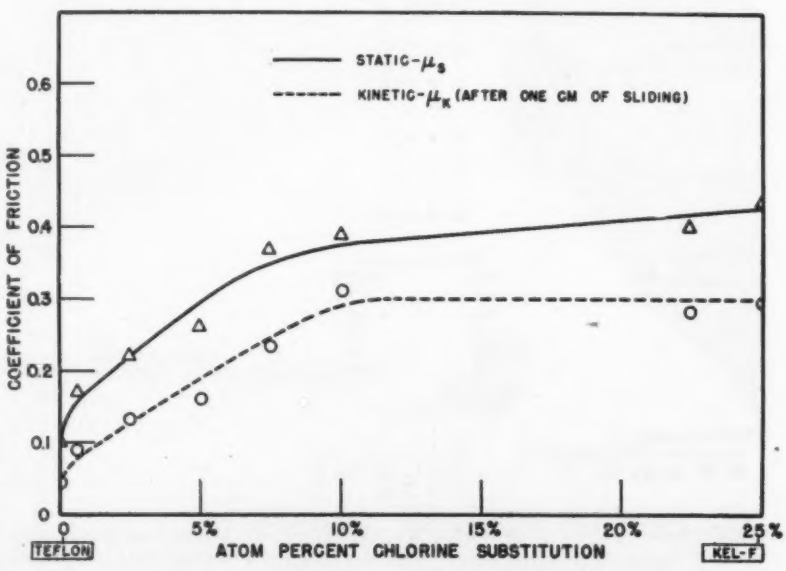


Fig. 2—Coefficient of friction for steel on T.F.E.-T.F.C.E. abraded copolymers

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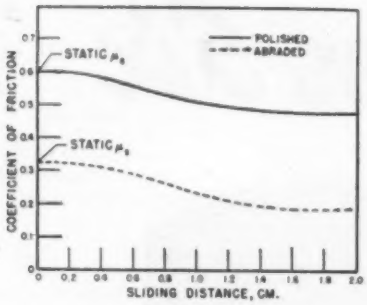

Fig. 3—Coefficients of friction for steel sliding on polyethylene

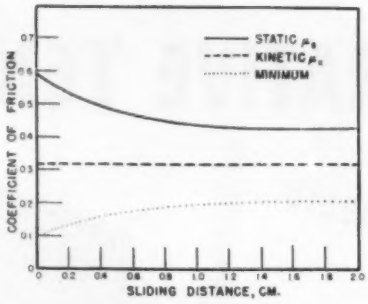

Fig. 4—Coefficients of friction for steel on polished T.F.C.E.

greater friction being attributed to the amorphous nature of the surfaces and to the increase in the real area of contact caused by the accompanying softness of the surfaces. During sliding a general decrease in μ_k occurred, much the same as that observed with the abraded plastics.

Steel on Class II Plastics

As steel slid on the surface of any of the Class II polymers (i.e., polyvinyl chloride, polyvinylidene chloride, and T.F.C.E.), μ_s remained nearly constant for each abraded material, but there was a marked decrease in μ_s with sliding distance for heat-polished surfaces. In Fig. 4 are plotted the coefficients of friction for a steel ball sliding on polished T.F.C.E. Most pronounced of all was the decrease of μ_s in sliding steel on polished polyvinylidene chloride.

Figure 5 is a photograph of the friction track made by a steel ball sliding on heat-polished polyvinylidene chloride. It is evident from this figure that the width of the track decreases as sliding proceeds. In this instance the initial value of μ_s was 1.8 and the value at the end of the traverse was 1.0. Immediately after this experiment the frictional force was remeasured on a clean area of the platen but without recleaning the steel ball, and μ_s was found to have become constant at approximately 1.0. In contrast to Fig. 5, the track was smooth and of uniform width throughout. It is concluded that the rubbing surface of the steel ball had been coated with polyvinylidene chloride. Presumably, the lowered value of μ_s is due to the orientation of the transferred polymer.

It will also be observed in Fig. 5 that at the beginning of the track there appears to be a series of circular indentations. These indentations become less pronounced in the direction of sliding and eventually become indistinguishable. These may be explained by a consideration of the mechanics of the elastic measuring system. Here, μ_s is so great that the bifilar suspension is strained beyond its vertical axis of rotation, the axis of the ball slider is rotated beyond its normal position with respect to the platen, and the spring-steel band pressing the surfaces together is twisted. This results in the ball slider making a series of dynamic type indentations when slip occurs. Presumably, as the film transferred to the slider becomes oriented, the friction decreases and the mechanical system becomes less strained, thus reducing the impact of the dynamic indentation. The small area of contact which results, together with the oriented film, reduces the adhesive force.

Friction of Plastic on Plastic

Of the Class I plastics, only T.F.E. and polyethylene were available in a shape convenient for measuring the friction of the bulk plastic against itself. Abraded surfaces of each plastic were used, and it was found that μ_k exhibited constant values during sliding of 0.04 and 0.33, respectively. Since μ_k remained constant during sliding, it is presumed that no orientation of the polymers occurred. When the surfaces of the polyethylene specimens were heat-polished, μ_s and μ_k approximately doubled. The greater friction is attributed to the amorphous nature of the surface and to the increase in the real area of contact caused by its softness.

Class II plastics (T.F.C.E., polyvinyl chloride, and polyvinylidene chloride) all exhibited intense localized adhesion and shearing. With the exception of T.F.C.E., μ_s increased as sliding proceeded (see Table II); and this increase was much more apparent when the polymer surfaces were heat-polished. A photograph of the results of sliding polished polyvinylidene chloride sliding on itself is shown in Fig. 6. It will be seen that the width of

Fig. 5—Wear track for steel ball on polished polyvinylidene chloride

Fig. 6—Track of polished polyvinylidene chloride ball on polished polyvinylidene chloride

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Fig. 7—Polished polyvinylidene chloride sliding on polished polyvinylidene chloride

the wear track also increased as sliding proceeded. This can account for the increase in μ_s. In Fig. 7 are photomicrographs of portions of the wear track and slider wear-scar, and they make evident the large and intermittent transfer of material by localized adhesion and shearing during the relaxation oscillation.

Friction of Plastic on Steel

T.F.E. and polyethylene were the only Class I plastics which could be studied conveniently by sliding a plastic hemisphere on a steel platen. Using an abraded T.F.E. slider, μ_k rapidly decreased during one traverse from 0.10 to 0.04. At the moment sliding started, the value of μ_s represented the friction of the polymer sliding on clean steel. At this point, it should therefore equal the static coefficient of friction for the reverse sliding condition, i.e., for clean steel sliding on the polymer. The data of Table II support this conclusion. Promptly after relative motion began, T.F.E. was presumably transferred to the steel platen, and the sliding combination was essentially polymer sliding on polymer coated steel. Therefore, it is not surprising that μ_k for T.F.E. on steel dropped sharply from 0.10 to 0.04 as sliding began, because μ_k for bulk T.F.E. sliding on itself is 0.04.

An abraded polyethylene slider traversing a clean steel platen had a value of μ_k of of 0.33, the same as for bulk polyethylene sliding on itself. Here one would expect μ_k to have decreased to the same value of 0.25 found earlier at the end of the traverse of a steel ball over a polyethylene platen. But it is to be noted that as a polyethylene hemisphere slides on clean steel, material of the slider near the leading edge adheres to the steel platen, is sheared off, and then is rubbed into an oriented condition as the rest of the slider moves over it. Hence, the observed coefficient of friction of 0.33 is not entirely that of the slider against a transferred film of oriented polymer. However, as a steel hemisphere starts to slide over a polyethylene platen, some polymer adheres to the spherical steel surface, and it remains there to be rubbed against the polyethylene platen during the rest of the traverse. Hence, it is oriented polyethylene. When the polyethylene ball was heat-polished both μ_s and μ_k were greater. The fact that μ_k remained constant may be explained in the same manner as above.

A steel platen and a steel ball 12.7 mm. in diameter were both rubbed in one direction with bulk polyethylene, and then the coefficient of friction was determined between the coated metals at a normal load of 0.8 kilogram. A very low and constant kinetic coefficient of friction of 0.05 resulted. Microscopic examination of the above mentioned steel platen revealed that small particles of polyethylene were scattered widely over the rubbed area, although there was no visual evidence of a continuous film. The friction measurements, however, showed that polyethylene must have formed a nearly continuous film when rubbed on the steel surface, because the steel was so well covered as to prevent metal-to-metal contact and to result in a constant value of μ_k.

A steel ball and a steel platen were each rubbed with T.F.E. in a manner similar to that previously used with polyethylene, but μ_k was found to vary erratically between 0.25 and 0.10 during sliding. Microscopic examination revealed some large and a great many small particles of T.F.E. scattered over the surface of the steel. A photomicrograph of the larger particles trans-

Fig. 8—Transfer of T.F.E. by rubbing T.F.E. slider on steel platen

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ferred is given in Fig. 8. It is concluded that the transferred film of T.F.E. is spotty rather than continuous; it varies greatly in thickness; and it is definitely less uniform and thinner than the film of polyethylene prepared in the same way. Wherever the film was interrupted, the steel slider made contact with the hard metal substrate and the coefficient of friction increased suddenly. This was the cause of the observed erratic variations of μ_k between values of 0.25 and 0.10.

Electron diffraction patterns were obtained by the reflection method with a G.E. Diffraction Unit Model

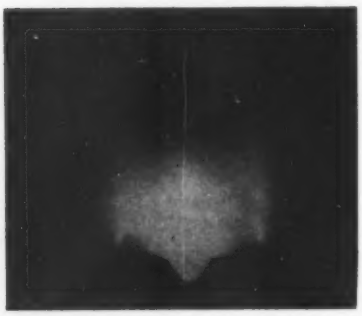

Fig. 9—Electron diffraction pattern of a steel surface following a single traverse with a polyethylene slider

G-2 at a potential of 30,000 volts. A series of good patterns such as Fig. 9 were obtained on examining a steel platen which had been rubbed in one traverse by an abraded polyethylene hemispherical slider. These patterns established beyond doubt that polyethylene had been transferred from the slider to the steel platen, and that the crystallites of this material had become well oriented so that the long axes of the polymer molecules were in the plane of the platen and were nearly all pointed in the direction of sliding. This orientation is like that indicated by the change in μ_k from 0.33 to 0.25 during successive traverses of steel on a polyethylene platen. Hence, in each case the polyethylene transferred to the steel was oriented. A similar electron diffraction examination of a steel platen rubbed by an abraded T.F.E. slider showed that the polytetrafluoroethylene molecules were also highly oriented in the surface of the platen and were pointing with the long axes in the direction of sliding. It is difficult to see how such pronounced orientation could have developed without involving much slipping either at the metal-plastic interface or between the surface of the bulk plastic and the exposed surface of the transferred plastic. The latter is the more likely for polyethylene sliding on steel.

When the abraded polymers of Class II slid on steel, μ_s increased as sliding proceeded (Table II). Polyvinylidene chloride exhibited the greatest increase, polyvinyl chloride showed a small but detectable increase, and the increase with T.F.C.E. was very slight. The increase in μ_s during the traverse may have been due to the softening of the polymer by frictional heat generated during the "slips" or to the retarded elastic nature of the plastics.

Since the adhesion and subsequent velocity of slip are greater for polyvinylidene chloride, it is reasonable to assume that there will be greater softening at the points of contact than for polyvinyl chloride. A larger increase in the slider area of contact would result for polyvinylidene chloride as sliding proceeded and this would cause a greater increase in μ_s. T.F.C.E. has a much higher molding temperature than the other two polymers, and the adhesion and slips are smaller; hence there is little increase in the apparent area of contact or in μ_s as sliding proceeds. In the beginning of the traverse, Class II plastics exhibit higher coefficients of friction when polished than when abraded, and the same type of increase of μ_s as sliding proceeds. But as the soft polished surface was worn away, the frictional force began to decrease and eventually approached the value characteristic of an abraded surface. A polished polyvinylidene chloride ball approached this condition after sliding only a few centimeters. It can be seen in Fig. 10 that the amount of polyvinylidene chloride adhering to the steel platen decreased as sliding proceeded.

T.F.E. Films on Metals

Studies were also made of smooth, uniform, thin films of T.F.E. deposited on steel and brass using a commercial T.F.E. suspensoid in water. With 12.7-mm. diameter ball sliders and a normal load of 0.8 kg. at 78°F., the value of μ_s observed was 0.04, and μ_k was constant and the same in value. Increasing the temperature to 250°F. had no effect upon either μ_s or μ_k. It will be noted that the value of 0.04 for the initial coefficient of static friction is lower than that of 0.10 reported in Table II for steel sliding on abraded bulk T.F.E. But 0.04 is precisely the value of μ_s for T.F.E. sliding on T.F.E.; hence, it is concluded that T.F.E. must have been immediately transferred to the slider. Apparently, the physical nature of the baked-on T.F.E. coating is such that the transfer of particles of polymer occurs immediately upon loading the ball; and it appears impossible to determine μ_s for uncontaminated steel sliding on this type of coating. The ease with which T.F.E. particles from the coating are transferred during sliding is presumed to be due to the fact that the particles in the coating are not sintered at all points of contact; in bulk T.F.E., which is made by fusion and high compression, the particles are probably sintered at many more points of contact.

Because of the ease with which T.F.E. particles from the coating

Fig. 10—Wear track for polished polyvinylidene chloride on steel

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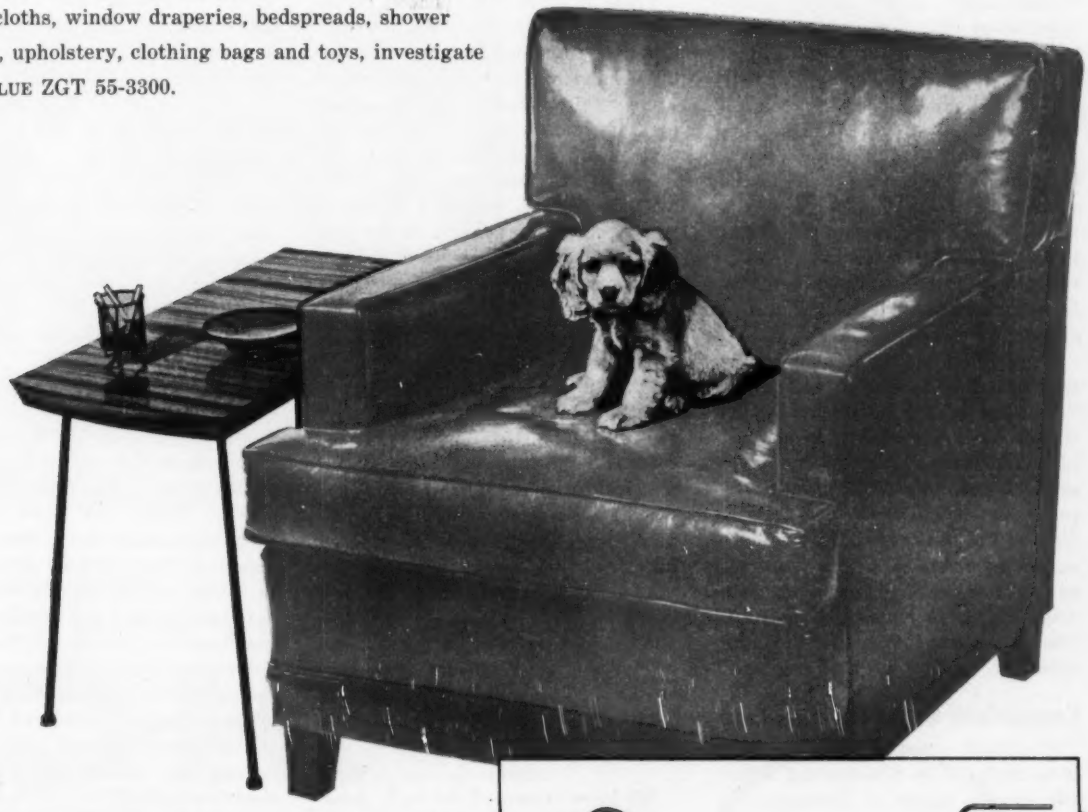

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Table IV—Comparison of Shear Strengths (s) and Yield Pressures (p) of the Polymers with the Coefficients of Friction (μ_s)

Polymer	*s*	p	*s/p*	μ_s
	kg./mm.²	*kg./mm.²*		
TFE	1.68	4.0	0.42	0.10
Polyethylene	0.91	2.97	0.31	0.33
TFCE	3.32	15.9	0.21	0.43
Polyvinyl chloride	5.05	14.9	0.34	0.45
Polyvinylidene chloride	4.06	6.67	0.61	0.68

were transferred by rubbing against the ball slider, the durability of the baked-on coating was examined. Static and kinetic coefficients of friction were measured at regular intervals as a steel slider was moved 100 times back and forth at the rate of 0.1 cm./sec. over the same path, the slider always being removed and cleaned just before each friction measurement. After twenty traverses over the same track there was no change in the coefficient of friction ($\mu_s=\mu_k=0.04$). After thirty traverses both μ_s and μ_k increased slightly. Even after 100 passes μ_s had risen only to 0.13 and μ_k to 0.08. Photomicrographs were made of the wear tracks at various stages of the wear process, but at no time was there evidence of excessive wear or rupture of the film. Such behavior is characteristic of a good condition of boundary lubrication.

In addition to this transfer property and low coefficient of friction, thin films of T.F.E. on hard substrates have the ability to support high pressures. Although the yield pressure of bulk T.F.E. is in the range of 4000 to 6000 p.s.i., T.F.E. films of the thickness described here supported pressures nearly ten times as great when the hard substrate was a metal such as brass or steel. The reason for this is that the hard substrate carried most of the load.

Comparison with Published Data

Frictional measurements have been reported by Shooter and Tabor (2) using a group of plastics which had been abraded with 600A emery paper under water. Such surface treatment is believed similar to the rotary abrasion of the surfaces reported here. Their work concerned bulk T.F.E., polyethylene, and plasticized as well as unplasticized polyvinyl chloride. The static coefficient of friction reported by us for these three plastics and for all their sliding combinations are in good agreement with the values designated by Shooter and Tabor merely as the coefficient of friction. Since they did not report any variation of friction with sliding distance, and since it was never clear whether the values were static or kinetic, it is impossible to compare in detail our results with those they reported.

These authors chose a load range and slider radii of curvature such that the ploughing action was negligible and the real area of contact was, within a factor of two, equal to the apparent area. They showed that except for T.F.E. the frictional force (F) between the steel slider and plastic was, within a factor of two, equal to the product of the real area of contact (a) and the bulk shear strength (s) of the plastics; i.e.,

$$F = sa \qquad \text{Eq. 1}$$

Thus, the conclusion was reached that for plastics where equation 1 is applicable, shearing occurs within the bulk of the plastic and the frictional force is determined only by the bulk physical properties of the plastics. But the area of contact could be expressed by the quotient of the applied load (W) and the yield pressure (p), or

$$a = W/p \qquad \text{Eq. 2}$$

and the frictional force is equal to the product of the coefficient of friction (μ) and the applied load, or

$$F = \mu W \qquad \text{Eq. 3}$$

Then it follows that

$$\mu = (s/p). \qquad \text{Eq. 4}$$

We have measured the bulk shear strength of these plastics by A.S.T.M. Test Method D732-46. Yield pressures were determined by static indentation measurements in the region where the whole of the material around the area of contact was flowing plastically. The yield pressure, measured with a ball 3.96 mm. in diameter and at loads greater than 10 kg., was always constant for each plastic. The values of (s) and (p), as determined from our data, and s/p, are listed in Table IV, together with the observed coefficients of static friction (μ_s).

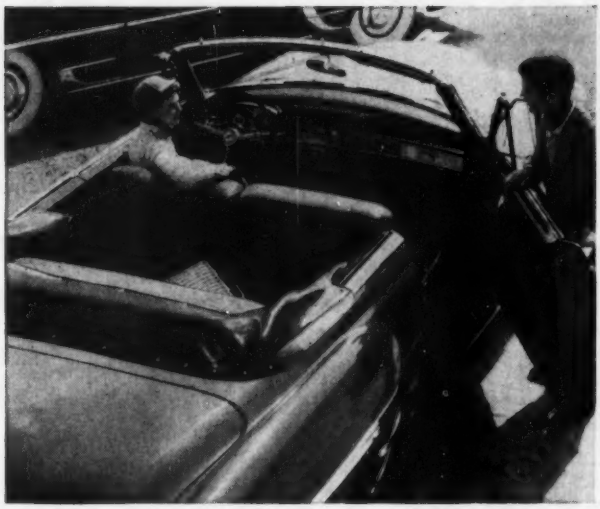
All values of μ_s listed in Table IV were obtained with rotary-abraded rather than with polished plastic surfaces. These values are preferred for comparing μ_s with s/p because: 1) the rotary-abraded surfaces nearly approximate those employed by Shooter and Tabor (2); 2) we found the reproducibility of μ_s to be best with abraded surfaces; and 3) we found polished specimens to have very soft surfaces so that they could not be used in comparing the shear strength of the soft surface layer with that of the bulk material. In general, our measured values of μ_s for T.F.E., polyethylene, and polyvinyl chloride are in good agreement with those reported by Shooter and Tabor. Since these authors did not report the molecular weights of their plastics nor their measured values of either p or s/p, much of their other data cannot be compared with ours.

The same plastic specimen was used to measure μ_s and p but another specimen was used to measure s. This may have contributed to the uncertainty on the measurement of shearing strength. The most reliable value of s is that for T.F.E. ($\pm 0.8\%$), and the least reliable is for polyvinylidene chloride ($\pm 10\%$).

Our results are in agreement with the conclusion of Shooter and Tabor (2) that, except for T.F.E., the measured values of μ_s are within a factor of two equal to the measured values of s/p. Hence, our work supports their conclusion that a major component of the frictional force is due to the strong adhesion which occurs between the steel ball and the plastic, resulting in a shearing in the plastic below the interface. This was clearly shown by the behavior of a steel ball sliding on polyethylene, and the associated transferring of material. Of course, as sliding proceeds, this shearing in depth is modified first by shearing between the plastic transferred to the steel ball and the bulk plastic, and later by shearing between the oriented transferred plastic and the bulk plastic.

In comparing s/p with μ_s in Table IV, we have used only the values of μ_s obtained at the beginning of sliding. With respect to T.F.E., the dis-

(*Continued on p. 210*)



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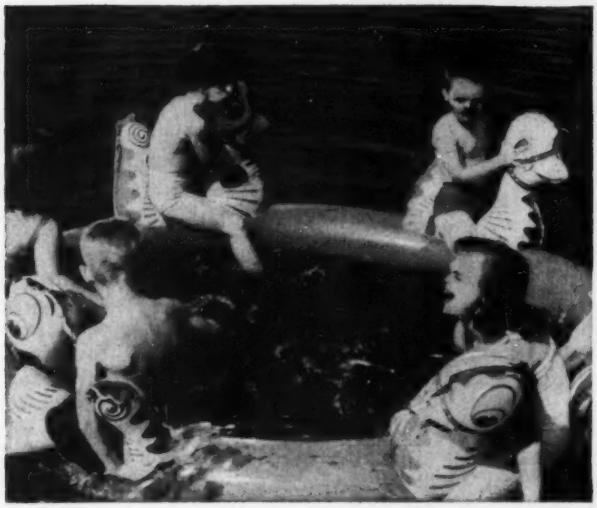

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Modified Phenol-Formaldehyde Resins

II. Modification by Epichlorohydrin

by Thomas G. Harris,* Gino J. Frisone,† and Harvey A. Neville**

Modification of intermediate phenol-formaldehyde condensation products (resols) by means of epichlorohydrin is described. In this modification the epoxy groups of the reagent are not consumed in the process under proper conditions, but are available for further reaction with other materials such as organic acids, amines, and phenols. The degree to which the phenolic hydroxyls are blocked may be widely varied. With complete conversion, resins having excellent color, alkali resistance, and flexibility are obtained.

THE modification of phenol-formaldehyde condensation products by monofunctional 1,2 epoxides has been previously reported (1)[1]. This article will describe the modification of similar products by epichlorohydrin, a difunctional 1,2 epoxide.

Epichlorohydrin has received considerable attention as a raw material in resin manufacture. Its reaction with a dihydric phenol forms the basis for a new development, the epoxy resins (2-4). These resins, or derivatives thereof (5,6), are finding use as adhesives, coatings, potting resins, and stabilizers for halogen-containing polymers (7-15).

The basic structure of these epoxy resins consists of a chain joined through ether linkages, secondary hydroxyl groups being uniformly distributed along the length. Free epoxy groups are few in number and located only at the ends of each chain.

The resins discussed in this paper differ from the epoxy resins in that the epichlorohydrin is reacted with a previously formed resol. This procedure possesses several distinct advantages:

1) It renders possible modifications to be made extending from those in which only a few phenolic hydroxyls have been blocked, to those in which phenolic hydroxyls are no longer present. As the amount of modification increases the poor alkali resistance and poor color of the phenolic resins are overcome and their tendency to thermoset is replaced by a new type of reactivity originating from the presence of epoxy groups in the reaction.

2) The epoxy groups need not be consumed in building resinous structure, but can be retained instead for use during application or for the formation of derivatives.

*Chemtan Co., Nashua, N. H., †Atlas Powder Co., Wilmington, Del., **Dept. of Chemistry, Lehigh University, Bethlehem, Pa.

[1] Numbers in parentheses link to references at end of article.

Preparation of Epoxy Phenolics

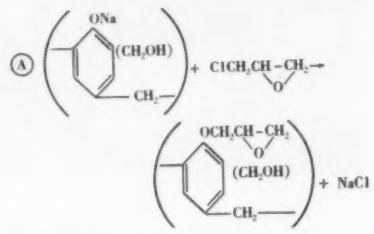
The phenol-formaldehyde condensation products, the resols, have been prepared as described previously (1). Formalin solution (37%, U.S.P.) and sodium hydroxide catalyst (3% by weight on the basis of the phenol) have been used throughout and the mol ratio of phenol to formaldehyde has been held at 1:2.32 except where otherwise noted. The initial condensation was continued until the free formaldehyde content approached a relatively constant value, but was always interrupted before the onset of a rapid increase in viscosity.

The epichlorohydrin is introduced into the resol at this stage and the system heated at reflux until separation occurs or until measurements of pH, epoxy value, or free caustic content indicate that the reaction has proceeded to the desired extent.

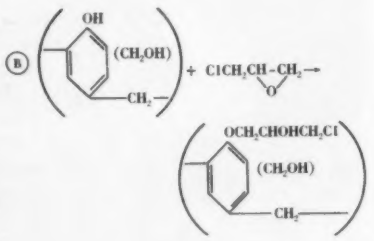
pH Values

The modification by epichlorohydrin is accompanied by a pH fall in contrast to the pH rise noted with the monofunctional 1,2 epoxides (1). A typical pH curve obtained during the reaction of a phenol-formaldehyde condensation product of mol ratio 1:2.32 with 1 mol of epichlorohydrin per mol of phenol is shown in Fig. 1, p. 149.

The pH change suggests mechanism (A) as the principal reaction taking place:



Mechanism (B) is also believed to occur to some extent during the initial stages:



The amount of sodium hydroxide present is insufficient to permit mechanism (A) to occur to the extent needed to account for the yields and changes in properties noted in Table I, p. 149.

The materials described in Table I were prepared by refluxing the resol and the recorded amounts of epichlorohydrin for a period of 20 min., cooling, allowing separation to occur, discarding the aqueous layer (unreacted epichlorohydrin as droplets on surface), and dehydrating the resinous layer to constant weight at 80° C. and 40-mm. pressure; it was then poured into a suitable mold and cured for 42 hr. at 90° C.

When the resol is weakly acidified prior to the introduction of the epichlorohydrin, the pH increases during the reflux period. For example, acidification to a pH of 4.2 with lactic acid followed by the addition of 0.59 mol of epichlorohydrin per mol of phenol yields a composition of pH 7.0 after 20 min. of reflux;

DESIGN and PRODUCTION NEWS

FOR PLASTICS AND MATERIALS ENGINEERS

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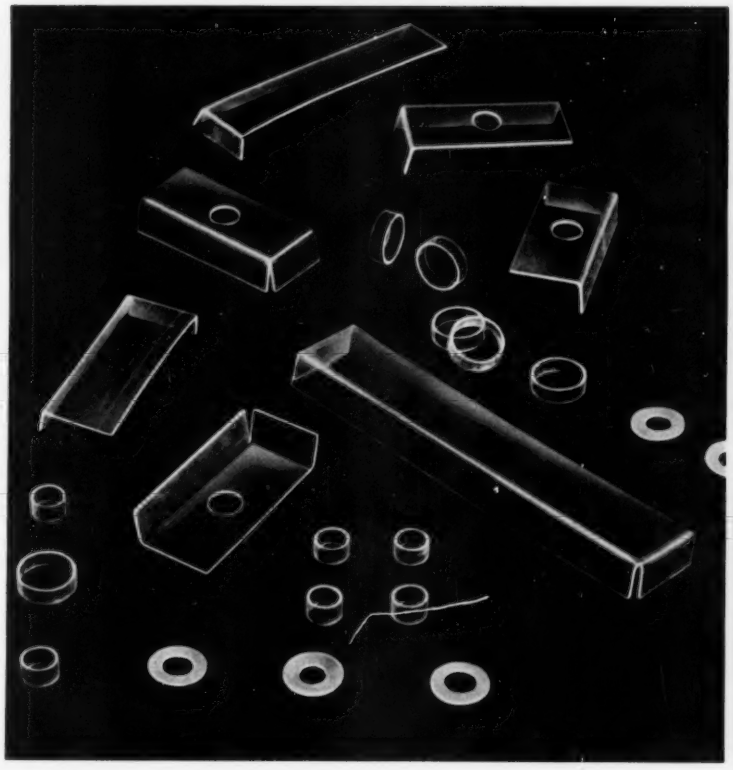
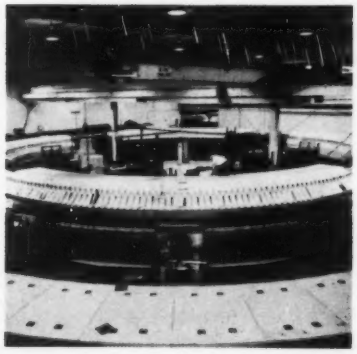
For further information ask for Application Report E-120





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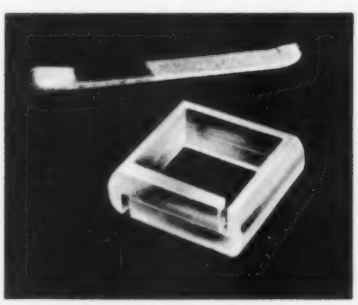

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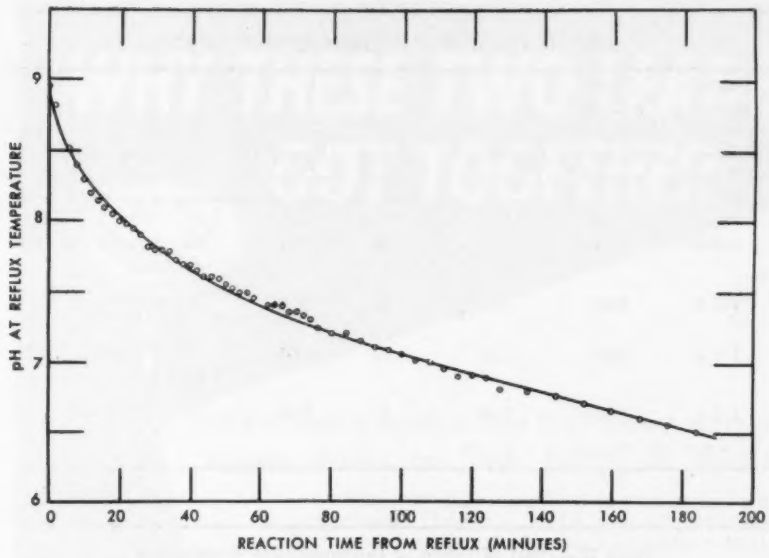

Fig. 1—Curve showing typical changes in pH values with reflux time for a phenol-formaldehyde system in which modification by epichlorohydrin has taken place

the acid is probably preferentially attacked and consumed by the epichlorohydrin.

When the amount of alkali in the resol is increased prior to the introduction of the epichlorohydrin, the proportion which reacts through mechanism (A) increases greatly. This is shown in Table II, p. 150; the epoxy values of the resin were determined after neutralization, washing, and dehydration at 80° C. and 30-mm. pressure until the resin became clear.

The introduction of additional alkali increases the pH of the system and favors further condensation of the phenol and formaldehyde. This frequently proceeds to gelation unless the epichlorohydrin is present in a higher mol ratio than the alkali. The alkali content under such conditions is quickly consumed. This can be shown by removing aliquots at intervals, dissolving in ethyl alcohol, and titrating rapidly with 20% hydrochloric acid solution to a first endpoint with brom phenol blue indicator. Subsequent fading of the endpoint is ignored. A typical modification (0.60 mol sodium hydroxide, 1.2 mol epichlorohydrin per mol phenol) measures less than 0.024 mol of sodium hydroxide per mol phenol remaining after 3 min. at reflux.

The viscosity of the modified resin increases with lengthening time at reflux. A modification employing 0.60 mol total sodium hydroxide and 1.2 mol of epichlorohydrin per mol of phenol is just redispersible in the aqueous phase by vigorous stirring after 10 min. of reflux, but is not dispersible and has a heavy taffy-like consistency after 60 min. of reflux.

The length of time employed for the initial condensation of the phenol and formaldehyde affects the rapidity with which clouding occurs during the subsequent epichlorohydrin modification. Initial condensation times at reflux of 0 to 5, 10 to 15, and 20 to 25 min. will produce clouding during modification (0.10 mol sodium hydroxide, 0.20 mol epichlorohydrin per mol of phenol) after a reflux of 23+, 19 to 23, and 9 to 11 min., respectively.

The time of condensation at reflux of the phenol and the formaldehyde initially also affects the viscosity of the modified product. Modifications employing 0.30 mol of sodium hydroxide, 0.60 mol of epichlorohydrin per mol of phenol and 13 min. reflux range from a viscous liquid (4 min. initial condensation) to a taffy-like product (20 min. initial condensation); modifications employing 0.10 mol of sodium hydroxide, 0.20 mol of epichlorohydrin and 20 min. reflux extend from a non-separated product (no initial condensation) to a material of marshmallow consistency (20 min. initial condensation).

Properties of Epoxy Phenolics

The pH of the modified system is higher the greater the amount of modification after a predetermined time at reflux (See Fig. 2, p. 150); the epichlorohydrin was present in 100% excess in all instances, based on the sodium hydroxide used.

The resistance of the resins to caustic improves with increasing modification. A casting produced from a typical modification (0.60 mol of sodium hydroxide, 1.2 mols of epichlorohydrin per mol of phenol), when cast and cured for 2½ days at 90° C., displays no apparent deterioration when placed in a boiling 25% sodium hydroxide solution for 5 minutes. A standard phenolic casting treated similarly turns brown, the surface softens, and hairlike cracks form upon drying.

The color and film-forming properties also improve with increasing modification. This is shown in Table

Table I—Properties of Castings Made of Epichlorohydrin Modified Phenol-Formaldehyde Resins[a]

Epichlorohydrin per mol of phenol	*Yield of dehydrated resin per g. of phenol*	*Casting viscosity*	*Rockwell hardness (H scale)*	*Appearance of casting*
mol	*g.*			
0.25	1.85	Unpourable	—	—
0.50	2.04	Normal	+36	Slightly off-white heavily opaque
0.75	2.19	Slightly thinner than normal	—22	—
1.00	2.30	Thinner than normal	—30	Almost white, translucent

[a] Sodium hydroxide catalyst: 0.07 mol/mol phenol.

III for a series of modified resins. The modifying step was of 25-min. duration at reflux; the preparation of the resins was completed by cooling, neutralization, and separation. Dioxane solutions were prepared, filtered, and employed to coat Fiberglas tapes, which were air-dried and then baked 10 min. at 175° C.

Reaction with Acids

The epoxy phenolics are capable of still further modification by reacting them with acids, amines, or phenols.

Saturated monobasic acids, such as acetic or lactic, can be employed with partially modified products to form castings or with completely modified products to form plasticizing materials.

A hazy, colorless, transparent casting results from the treatment of an epoxy phenolic (0.30 mol sodium hydroxide, 0.60 mol epichlorohydrin) with 0.43 mol of lactic acid. A straw-yellow product is obtained from the reaction of an epoxy phenolic (1.0 sodium hydroxide, 2.0 mols epichlorohydrin) with 0.23 mol of acetic acid.

Unsaturated monobasic acids, such as crotonic or cinnamic, yield derivatives which can be polymerized alone or with other monomers. Acids such as linoleic acid or linolenic acid yield air drying compositions.

Saturated polybasic acids such as succinic acid form compositions of particular interest as coatings.

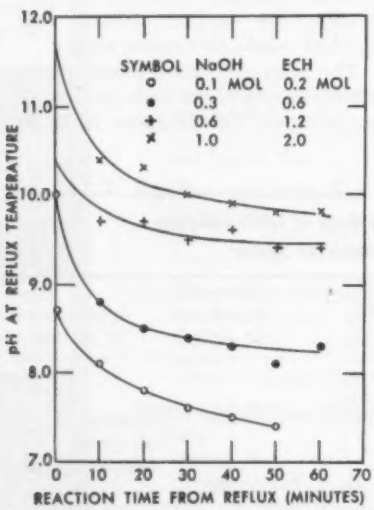

Fig. 2—Changes in pH values which result from the modification of resin with different amounts of epichlorohydrin and sodium hydroxide

Table II—Epoxy Values of Typical Epoxy Phenolics

Initial phenol formaldehyde mol ratio	*Total sodium hydroxide per mol of phenol*	*Epichlorohydrin*	*Reflux time*	*Epoxy value*[a]	*Epoxy value determined by*
	mol	*mol*	*min.*		
1:2.32	0.30	0.60	20	19.3	Pyridinium chloride method
1:2.32	0.60	1.20	20	26.0	Amine method
1:1.4	0.60	1.20	20	23.0	Pyridinium chloride method
1:1.4	0.60	1.20	20	30.0	Amine method

[a] Ml. of 0.1N HCl consumed per g. of resin.

Table III—Effect of Extent of Epichlorohydrin Modification on the Color and Film-Forming Properties of Epoxy Phenolics

Sodium hydroxide	*Epichlorohydrin*	*Reflux time*	*Properties of baked fibrous glass tapes*
mol	*mol*	*min.*	
0.07	0.00	—	Deep yellow; brittle; very flaky
0.30	0.60	25	Very light yellow; brittle; slightly flaky
0.60	1.20	25	Very light tan; very slightly brittle
1.00	2.00	25	White; flexible

Unsaturated polybasic acids such as maleic acid form derivatives of interest as coatings either alone or in combination with other monomers.

Products closely resembling many of the above can also be produced by the reaction of the initial phenol-formaldehyde condensation product with a glycerol monochlorohydrin monoester or a glycidyl ester; these modifiers are prepared by the reaction of the epichlorohydrin with an acid or its salt, respectively.

Reaction with Amines

Amines react readily with epoxy phenolics. An epoxy phenolic (0.60 mol sodium hydroxide, 1.2 mols epichlorohydrin) was cooled, neutralized, washed, dehydrated, dissolved in dioxane, and divided into 100-g. portions.

Portion A was connected to a vacuum rig and the volatile components were removed at 90° C. and 30-mm. pressure. Portion B, after refluxing for 1 hr. with 0.82 mol of n-butyl amine, was treated similarly. The increased weight of the latter corresponds to 0.26 mol of n-butyl amine reacted per 100 g. resin. Rough calculations indicated 0.5 mol of n-butyl amine added per mol of phenol. This method has been adopted as a measure of epoxy value, care being taken to have a large excess of amine present.

Portion C, treated with 0.15 mol of freshly distilled aniline yielded a thin liquid product which was light-red and clear.

Portion D, treated with 0.33 mol of ethylene diamine formed a clear, yellow, viscous liquid. Portion E, employing 0.075 mol of ethylene diamine gelled at reflux. This suggests that ethylene diamine, in the proper proportions, functions as a cross-linking agent.

Reaction with Phenols

Portions of the dioxane solution described above were also used for reaction with phenols. Portion F, refluxed with 0.30 mol of resorcinol and freed of volatile materials, formed a clear, brown liquid prod-

(*Continued on p. 226*)

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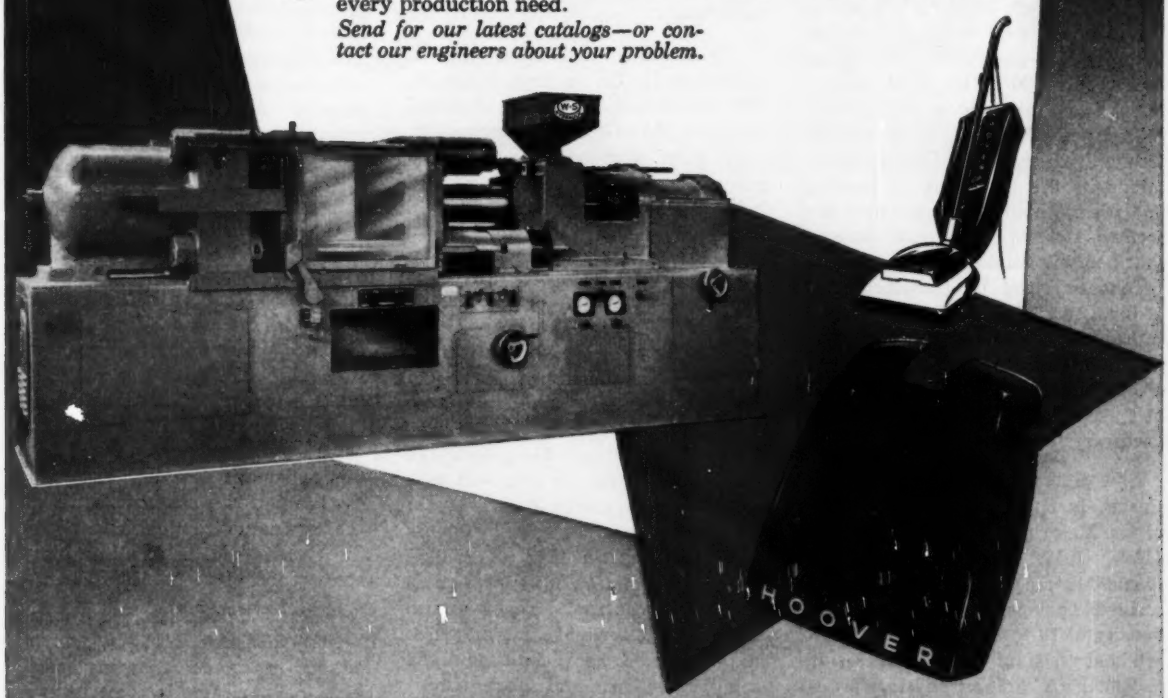

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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

Materials

SKIN HAZARDS IN THE USE OF RESINS. W. Schweisheimer. Canadian Plastics *1953*, 72-3 (Mar.-Apr. 1953). Workers who come in contact with such resinous materials as phenol-formaldehyde, urea-formaldehyde, coumarone, glyceryl-phthalate, vinyl, furfural, and chlorinated oils and balsams, can readily develop an occupational inflammation of the skin. Results of several investigations where it was found that the effects were contrary to normal expectations as regards tolerance limits and sensitivity are reported.

TEFLON JOINED BY FUSION BONDING. H. G. Henry. Materials & Methods *38*, 114-15 (Oct. 1953). A method is described for heat welding of Teflon to itself. It is possible by bonding in a furnace at 600° F. for 48 hr. to produce a lap or tongue and groove joint having 30 to 70% of the tensile strength of the base Teflon. Variations in the technique of heating and several applications are also described. Results of the tests disclose that bonding conditions are generally characterized by transformation of the Teflon from the white opaque substance to a translucent gel. The optimum bonding temperature is 660±10° F., with a time of 4 to 48 hr.; usually no external pressure is necessary.

NEW SILICONE RESIN—FOAMED IN PLACE—IS HIGH TEMPERATURE INSULATOR. Materials & Methods *38*, 96-97 (Nov. 1953). Two new silicone foamed-in-place resins are described. They can be cured to a bulk density of 10 to 20 lb./cu. foot. They are heat resistant to temperatures up to 700° F. A table of physical properties and information on expansion and forming are given.

NEW PHENOLIC-GLASS LAMINATES FOR ELEVATED TEMPERATURE. J. B. Campbell. Materials & Methods *38*, 87-91 (Nov. 1953). Theoretically the temperature of surfaces of planes flying at twice the speed of sound may reach 500° F. Phenolic-glass laminates offer promise for structural applications in the 300 to 500° F. range where polyester-glass laminates and some of the light metals may be unstable. The advantages and limitations, the materials presently being used and studied, physical properties, problems of fabrication, and possible practical applications are discussed. Most important advantage of this new material is its low loss of strength and modulus at elevated temperatures. Its biggest disadvantages are low modulus, high costs, and fabrication methods not suitable to high-speed production techniques.

VINYL TYPE POLYMERS. C. E. Schildknecht. Chem. Eng. News *31*, 4516-20 (Nov. 2, 1953). The chemical nature of the related styrene, acrylic, vinyl ether, pyrrolidone, and isopropenyl ketone polymers are compared briefly. Recent developments in these polymers are described.

USE AND POTENTIALITIES OF SPRAYED VINYLS. J. B. Singer. Plastics (London) *18*, 309-10, 327 (Sept. 1953). The toughness, ease of application, and good weathering properties of vinyl resin "skins" applied by spraying suggest application of this technique to buildings. The protective quality of the applied skin will permit the employment externally of materials formerly used only for interiors and could lead to radical changes in building design. It is now being used as a roof covering and to provide a watertight seal on brick and concrete walls. It can be sprayed on any type, size, and shape of material, producing an attractive, continuous, and flexible coating. It has also been used in swimming pools, and in bathrooms and kitchens as an interior finish.

CHEMISTRY OF UNSATURATED POLYESTER RESINS. C. P. Vale. Brit. Plastics *26*, 327-32 (Sept. 1953). An account is given of the chemistry of the polyester resins and their applications. A comprehensive list of references on this subject is included. The simple chemistry of esterification is reviewed. The methods of preparation of the raw materials used in polyester resins are presented. The materials covered are the glycols, unsaturated acids and anhydrides, saturated dibasic acid, styrene, and diallyl phthalate. The preparation and polymerization of unsaturated alkyds, as outlined in numerous articles and patents, is discussed. Applications of polyester resins and of glass fiber-polyester laminates are listed.

Molding and Fabricating

VACUUM METALLIZING OF PLASTICS. J. G. Seiter. India Rubber World *128*, 493-96 (July 1953). The process for vacuum metallizing of plastics is discussed in detail. Equipment used commercially in this process is described. Vacuum metallizing is compared with three other methods for depositing metallic coatings: electroplating, chemical reduction of silver nitrate, and electrostatic spraying. The properties of metallized coatings are discussed and numerous commercial applications of vacuum metallizing are given.

DECORATING AND MARKING OF PLASTIC PRODUCTS. A. N. Skeels. India Rubber World *127*, 803-805 (Mar. 1953). The various methods of decorating plastics products are discussed, together with their advantages and difficulties. The four basic methods are hot stamping, silk screening, offset printing, and filling-in. Other methods used to a lesser degree include paper labels, decalcomanias, engraving, rubber stamping, and mask spraying. Each process has its own characteristics, and the choice of method depends on the type of plastic and the desired appearance of the finished item.

PLASTICS PROCESSING. Lubrication *39*, 129-40 (Nov. 1953). Recommendations are made regarding specific types of lubricants for various types of machinery used in plastic molding and processing.

FORMING PHENOLIC AND POLYESTER PARTS IN VINYL PLASTISOL MOLDS. Rubber Age *73*, 648 (Aug. 1953). Inexpensive vinyl plastisol casting molds are used to form phenolic and

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polyester parts when limited quantities of parts are needed, making the use of metal molds too expensive. Approximately 50 phenolic parts and 10 to 50 polyester parts can be made in one plastic mold. The method of making the mold and the casting are discussed briefly and typical uses are given.

ENERGY CONVERSIONS IN THE FLOW OF HIGH POLYMERS: APPLICATIONS TO INJECTION MOLDING. H. L. Toor and S. D. Eagleton. J. Appl. Chem. *3*, 354-8 (Aug. 1953). From a general energy balance and Spencer and Gilmore's equation of state, energy relationships are developed for steady and non-steady flow of high polymers. Use of the equations to determine the temperature variations in an injection-molding cycle is indicated and the equations, together with one previously determined for non-flow conditions, are applied to an idealized injection-molding process. The resulting calculations for polystyrene, neglecting heat transfer, indicate that large temperature variations take place during a cycle. Consequently, any analysis of the process must take into account the energy conversions taking place. The thermal energy supplied to the polymer by viscous friction is shown to be an appreciable fraction of the total received.

Applications

PLASTICS APPLICATIONS IN BUSINESS MACHINES. F. W. Reynolds. Elec. Manuf. *53*, 112-17 (Oct. 1953). At least 17 different plastics materials are used in the manufacture of IBM equipment. This equipment demands precision made components and materials are sought which have a minimum of dimensional change and a maximum life under the varied atmospheric conditions encountered. Selected case histories show why phenolics, ureas, nylon, glass-polyesters, and other materials were selected for specific applications.

NEW STATUS OF THE FILM LINER. Modern Packaging *27*, 144-47, 233, 234 (Oct. 1953). Plastic film liners in fiber or metal drums, cartons, and bags are finding increased use because they offer product protection, freedom from contamination, complete product recovery, lower container cost, and lower shipping weight. Most of the liners are made from polyethylene film, but saran and vinyl film are also being used. Liners are being used to ship frozen meats, dried-milk products, fruits, hygroscopic chemicals, adhesives, wetting agents, corrosives, and pharmaceuticals.

FLEXIBLE VINYL TUBE. Modern Packaging *27*, 114-17 (Oct. 1953). A seamless flexible vinyl tube has found ready acceptance on the West Coast. While it lacks the roll-up characteristics of the metal collapsible tube, the vinyl tube is lighter, strong, and about equal in cost. Because of its strength, the new tube needs no carton or sleeve for protection in shipping. The plastic composition can be varied to meet special requirements for chemical, grease, and oil resistance, and withstands temperatures up to 250° F. without softening. It can be made transparent or opaque, in any color. The tube is handled on conventional tube-filling machinery and its open bottom end heat-sealed by special electronic equipment. The tube is manufactured by a dipping process and has no closure but is simply formed to a small nipple opened by cutting with scissors. It can be made with a replacement closure, however. It is not expected that the vinyl tube will displace the metal collapsible tube but rather will create a field of new uses, mostly where all of the product is dispensed and used at one time. Present uses include paint-mix colors and dental impression material.

MANUFACTURE OF MAGNETIC TAPES. C. P. Fagan. Plastics (London) *18*, 323-24 (Sept. 1953). Methods of preparation of iron oxide, used as the magnetic medium in recording tapes, are described. Properties of various materials used as tape bases are discussed. These include cellulose triacetate, super-calendered Kraft paper, and prestretched polyvinyl chloride. There is a growing demand for oriented polystyrene sheet and polyesters as tape bases. Cellulose nitrate lacquer is used to bind the oxide to the tape base. Typical formulations of magnetic dispersions are given and the process for making tape is described.

POLYETHYLENE SHIPPERS. Modern Packaging *27*, 133-35 (Oct. 1953). Polyethylene shipping containers for bulk transportation of corrosive chemicals are gaining wider acceptance, with three different types of containers now on the market. These are: a plywood-jacketed, blow-molded, bottle-shaped carboy; a square-shaped two-piece carboy which has the advantage of space saving in storage and shipping; and a steel-covered molded polyethylene drum. The first two of the above-mentioned containers have ICC approval and the third type is being used under temporary shipping permits. These containers are corrosion resistant, lightweight, unbreakable, and space saving. They are being used for acids, alkalies, distilled water, and pharmaceuticals.

Properties

DIFFUSION OF BENZENE AND METHYLENE CHLORIDE VAPORS INTO POLYSTYRENE. F. A. Long and R. J. Kokes. J. Am. Chem. Soc. *75*, 2232-37 (May 5, 1953). The rates of sorption and desorption of vapors of benzene and methylene chloride by films of polystyrene were studied at 30° and 40° C. and at a variety of pressures. The sorption and desorption characteristics are definitely related to the concentration of the solvent vapors.

SHEAR, FATIGUE, BEND, IMPACT, AND LONG-TIME-LOAD STRENGTH PROPERTIES OF STRUCTURAL METAL-TO-METAL ADHESIVES IN BONDS TO 24S-T3 ALUMINUM ALLOY. H. W. Eickner. Forest Products Laboratory Report No. 1836 (June 1953). Strength properties of nine commercially available adhesives, of the type formulated for structurally bonding metal to metal, were determined. The test procedures consisted of testing lap joints of 0.064-in. 24S-T3 clad aluminum alloy in shear at 72 to 76° F., at 178 to 182° F., at −65 to −70° F, after exposure to salt-water spray, and after immersion in aircraft fluids; in fatigue at 72 to 76° F. and at 178 to 182° F.; and in bending at 72 to 76° F. Bonds between 24S-T3 bare aluminum blocks were also tested in impact resistance at 72 to 76° F. and at −65 to −70° F.

Testing

LOW TEMPERATURE FLEXIBILITY OF UNPLASTICIZED POLYVINYL CHLORIDE. R. Hayes and D. A. Lannon. Brit. Plastics *26*, 301-305 (Aug. 1953). The British modification of the Clash-Berg test for measuring low temperature flexibility of plasticized

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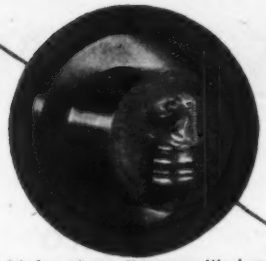

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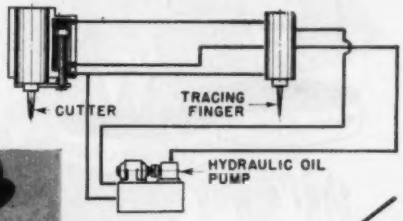

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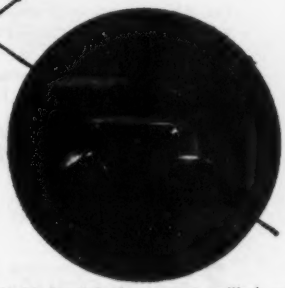

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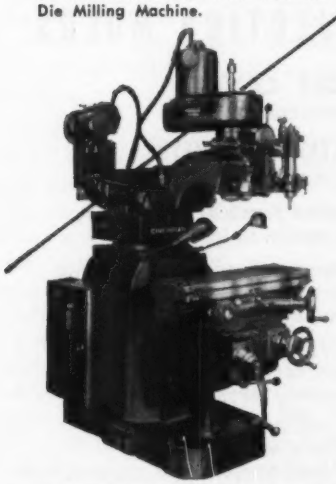

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polyvinyl chloride normally is described. The test consists essentially of measuring the angular deflection produced in a specimen of standard dimensions, when subjected to a constant torque at a series of temperatures. A graph of angular deflection against temperature is plotted and the temperature at which a deflection of 200° is achieved is called the "cold flex" temperature of the compound. The test is found to be an accurate and sensitive method of gaining an empirical measure of the low temperature performance of a polyvinyl chloride compound, although it is emphasized that it is a measure of stiffening and not the shatter or breaking temperature. The sensitivity of the test makes it useful for control work as changes in plasticizer content and type can be readily detected. For a compound containing a known plasticizer, the actual plasticizer concentration can be fairly easily estimated to about one percent. A linearity in the effect of plasticizer concentration on cold flex temperature, up to concentrations of 35 to 40%, was found with several common plasticizers studied in this investigation. Together with the apparently additive effect noted with certain mixtures of plasticizers, this means that after a limited amount of preliminary test work is done, reasonably accurate estimates of the cold flex temperatures of a very wide range of formulations can be obtained, providing a valuable and efficient tool for quality control work.

A Color Reaction Involving Vinyl Chloride Containing Polymers and Pyridine. H. Wechsler. J. Polymer Sci. *11*, 233-42 (Sept. 1953). When a dilute pyridine solution of vinyl chloride polymers or copolymers is heated and a few drops of alcoholic hydroxide are added to the hot solution, a dark brown color develops. The response of vinyl chloride polymers in this reaction is much more intense than that of most other organic compounds, probably due to the conjugated double bonds produced in the main chain through the loss of hydrogen chloride. In addition to straight degradation of the polymer, the formation of an isocyanine dye is suggested by a mechanism which, besides pyridine and the polymer, involves the alkali alkoxide as a reactant.

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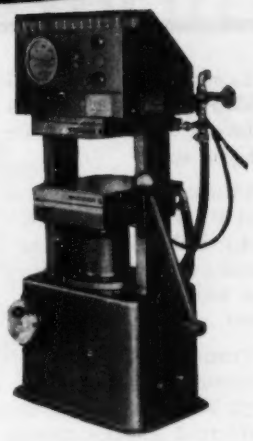

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U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

LANDING MAT. J. S. McGuire. U.S. 2,653,525, Sept. 29. Fibrous glass reinforced plastics mat for aircraft landing strip.

COMPOSITE ARTICLE. H. A. Hussey and D. D. Wright (to B. F. Goodrich). U.S. 2,653,884, Sept. 29. Rigid metal member and a flexible resinous member in composite arrangement.

TUBING. G. Slayter (to Owens-Corning Fiberglas). U.S. 2,653,887, Sept. 29. Production of fibrous glass-reinforced plastics tubing.

LAMINATE. K. F. Hager, H. I. Lindenmayr, and M. Rosenthal (to General Electric and U. S.). U.S. 2,653,889, Sept. 29. Heat-resistant laminate of metal, adhesive, and metal foil.

FIBROUS MATERIAL. A. H. Gentle and T. Jackson (to British Celanese). U.S. 2,653,892, Sept. 29. Treatment of fibrous material to improve bonding with vinyl chloride polymers.

FOAM MATERIAL. H. G. Hammon (to C. L. Wilson). U.S. 2,653,917, Sept. 29. Foamed copolymer of allylidene diethoxide and vinyl acetate.

POLYETHYLENE. E. Hunter (to Imperial Chemical). U.S. 2,653,919, Sept. 29. Aqueous dispersions of polyethylene.

MOLDED ARTICLES. C. G. Harford (to Arthur D. Little). U.S. 2,653,920, Sept. 29. Molded articles of furfuryl alcohol resin.

CATALYSTS. G. Sulzer (to Ciba). U.S. 2,653,921, Sept. 29. Boric acid salts as catalysts for aminoplasts.

RESINS. J. E. Shekleton (to General Aniline). U.S. 2,653,923, Sept. 29. Preparation of polyvinyl methyl ether.

PLASTICIZERS. J. Dazzi (to Monsanto). U.S. 2,653,948, Sept. 29. Vinyl chloride polymers plasticized with addition products of vegetable oil esters.

PAPER. J. L. Azorlosa (to Hercules). U.S. 2,654,671, Oct. 6. Wet strength paper containing vinyl pyridine resin.

ANTISTATIC COATING. A. Cresswell (to American Cyanamid). U.S. 2,654,678, Oct. 6. Coating vinyl resin articles with an N-(monoaliphatic hydrocarbon) diguanidinium sulfosuccinamate.

REINFORCED RESIN. E. H. Voelker (to Republic Aviation). U.S. 2,654,685, Oct. 6. Acrylic resin article with locally reinforced sections.

HONEYCOMB. O. A. Hansen (to Northrop Aircraft). U.S. 2,654,686, Oct. 6. Stiffened honeycomb core.

SHEET. J. S. Fridolph (to Sorg Paper). U.S. 2,654,687, Oct. 6. Laminate of wallboard, resin, and paper.

CELLULOSE TREATMENT. J. K. Dixon and N. T. Woodberry (to American Cyanamid). U.S. 2,654,715, Oct. 6. Adding aminotriazine-aldehyde resin to viscose rayon dope.

MOLDING POWDER. R. A. Sorenson (to Nixon Nitration). U.S. 2,654,716, Oct. 6. Cellulose acetate molding powder coated with vinylidene chloride resin.

POLYMERS. C. E. Rehberg and C. H. Fisher (to U. S.). U.S. 2,654,717, Oct. 6. Curing polymers of monoethylenic ethers and ether esters.

STABILIZER. O. J. Grummitt, R. E. Blank, and D. Marsh (to Sherwin-Williams). U.S. 2,654,718, Oct. 6. Vinyl resin stabilized with disodium hydrogen phosphate dodecahydrate in a bodied glyceride oil.

PLASTICIZERS. E. H. Schwencke (to Elastomer-Chemical). U.S. 2,654,719, Oct. 6. Vinyl resins plasticized with a hydrocarbon oil and a metal stearate.

POLYMERS. M. R. Lytton (to Chemstrand). U.S. 2,654,721, Oct. 6. Acrylonitrile polymers dissolved in N,N-di-methylacetamide.

POLYVINYL RESINS. C. E. Greene (to General Tire and Rubber). U.S. 2,654,723, Oct. 6. Polyvinyl chloride resin and a monocarboxylic keto aliphatic acid.

COPOLYMERS. H. Gilbert and F. F. Miller (to B. F. Goodrich). U.S. 2,654,724, Oct. 6. Copolymers of vinylidene cyanide and alkyl vinyl ketones.

POLYMERS. J. A. Price (to American Cyanamid). U.S. 2,654,725, Oct. 6. Polymerized compositions of an N-alkenyl-*o*-alkylisourea.

RESINS. J. W. Fisher, E. W. Wheatley, and G. B. May (to British Celanese). U.S. 2,654,726, Oct. 6. Polysulfone aminotriazoles.

RESINS. F. P. Otto and O. M. Reiff (to Socony-Vacuum). U.S. 2,654,727, Oct. 6. Esters of thiophene-modified maleic anhydride-styrene copolymers.

COPOLYMERS. H. Gilbert and F. F. Miller (to B. F. Goodrich). U.S. 2,654,728, Oct. 6. Copolymers of vinylidene cyanide with difluorodichloroethylenes.

POLYMERS. J. A. Price (to American Cyanamid). U.S. 2,654,729, Oct. 6. Polymerizable compositions of an unsaturated quaternary ammonium compound.

POLYMERS. H. W. Moll (to Dow). U.S. 2,654,730, Oct. 6. Coagulation of crystalline vinylidene chloride emulsions.

ACRYLONITRILE. H. T. Patterson (to du Pont). U.S. 2,654,731, Oct. 6. Control of acrylonitrile polymerization.

LUMINESCENT RESINS. E. M. Geiser (to Universal Oil). U.S. 2,654,732, Oct. 6. Luminescent resins from aryl-substituted alkyl halides and alkenyl ethers of a polyhydroxy organic compound.

TOOTH. J. O. Whiteley, Jr., and C. S. Fritz (to Dentists' Supply). U.S. 2,654,949, Oct. 13. Synthetic resin tooth.

AEROFOIL. J. E. Gordon and C. G. Evans (to Great Britain). U.S. 2,655,459, Oct. 13. Molded laminated aerofoil.

POLYESTER RESINS. J. C. Munday and D. T. Rogers (to Standard Oil). U.S. 2,655,479, Oct. 13. Pour depressants for polyester resins.

FOAMS. K. R. Hoffman (to Dow

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CELLUFLEX* 179C tricresyl phosphate petroleum base	Technical	Clear transparent liquid	150	1.165 ± .005	0.01 (2)	99	30	1.553
CELLUFLEX* 112 a mixed ester	Technical	Clear transparent liquid	40	1.210 ± .005	0.01 (2)	99	30	1.560
CELLUFLEX* TPP triphenyl phosphate	Technical	White flakes	20(4)	1.202 ± .005(1)	0.003 (3)	99	30	1.550 (1)
CELLUFLEX* DBP dibutyl phthalate	Technical	Clear transparent liquid	50	1.045 ± .001	0.01 (2)	98	—	1.490
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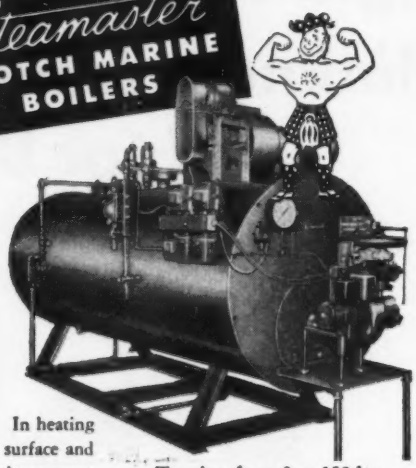

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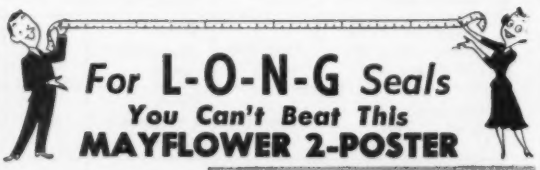

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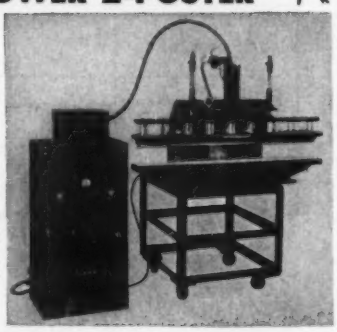

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Corning). U.S 2,655,485, Oct. 13. Siloxane structural foams.

ALKYD RESINS. A. C. Keyl and R. H. Geils (to F. A. Stressen-Reuter). U.S. 2,655,486-7, Oct. 13. Tetrahydrophthalic alkyd resins.

INTERPOLYMERS. E. W. Kanning and E. G. Hart (to Arco). U.S. 2,655,488, Oct. 13. Interpolymers of vinyl aromatic compound and conjugated oil fatty acid.

COATING. W. D. Lawson (to Du Pont). U.S. 2,655,489, Oct. 13. Coating of polyethylene and alkyd polysiloxane.

CATALYSTS. L. F. Sonnabend and A. M. Edmunds (to Dow). U.S. 2,655,490, Oct. 13. Mixture of trichloroacetic acid and benzenesulfonyl chloride as catalyst for phenolic resin.

FURAN RESIN. A. M. Edmunds and L. F. Sonnabend (to Dow). U.S. 2,655,491, Oct. 13. Self-hardening furan resin.

POLYETHYLENE. D. W. Young and P. E. Hardy (to Standard Oil). U.S. 2,655,492, Oct. 13. Polyethylene compositions containing styrene-isobutylene copolymers.

POLYMERS. J. A. Price (to American Cyanamid). U.S. 2,655,493, Oct. 13. Polymerized compositions of O-allylisourea.

ACRYLONITRILE. E. L. Kropa and E. W. Malmberg (to American Cyanamid). U.S. 2,655,494, Oct. 13. Polymerizable acrylonitrile composition.

POLYMERIZATION. J. J. Adams (to Dow). U.S. 2,655,496, Oct. 13. Emulsion polymerization.

LAMINATES. D. Gonda and A. A. Hodge (to Holoplast). U.S. 2,655,978, Oct. 20. Manufacture of corrugated plastic laminates.

SURFACE TREATMENT. J. W. Tamblyn and R. M. Schulken (to Eastman Kodak). U.S. 2,656,288, Oct. 20. Treating cellulose acetate butyrate with ethyl alcohol and dimethyl carbonate.

ADHESIVES. H. G. Davis, Jr., W. L. Durette, and E. C. Johnson (to B. B. Chemical). U.S. 2,656,297, Oct. 20. Adhesives for polyethylene.

ACRYLONITRILE. P. W. Gann and G. E. Ham (to Chemstrand). U.S.

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2,656,325-6, Oct. 20. Dyeable acrylonitrile copolymers.

ACRYLONITRILE. J. R. Caldwell (to Eastman Kodak). U.S. 2,656,328, Oct. 20. Acrylonitrile polymer solutions.

SUSPENSIONS. M. M. Sprung (to General Electric). U.S. 2,656,330-1-2, Oct. 20. Suspensions of polymeric chlorotrifluoroethylene.

VINYL HALIDES. G. S. Schaffel and G. H. Swart (to General Tire and Rubber). U.S. 2,656,333, Oct. 20. Plasticized polyvinyl halide compositions.

POLYMERIZATION. G. F. d'Alelio (to Koppers). U.S. 2,656,334, Oct. 20. Catalytic polymerization of vinyl aryl compounds.

RESIN. H. S. Bloch (to Universal Oil Products). U.S. 2,656,335, Oct. 20. Phenol-aldehyde or phenol-ketone resins.

ACRYLONITRILE. G. E. Ham (to Chemstrand). U.S. 2,656,336, Oct. 20. Dye-receptive acrylonitrile polymers.

COPOLYMERS. J. R. Caldwell (to Eastman Kodak). U.S. 2,656,337, Oct. 20. Copolymers of acrylonitrile and allyl and 2-methallyl chlorides.

COPOLYMERS. M. R. Lytton (to Chemstrand). U.S. 2,656,338, Oct. 20. Copolymers of butene-1 derivatives.

POLYMERS. J. J. Padbury (to American Cyanamid). U.S. 2,656,339, Oct. 20. Polymerizable compositions of acrylonitrile and a vinyl or isopropenyl amino aromatic compounds.

COPOLYMERS. W. J. Sparks and D. W. Young (to Standard Oil). U.S. 2,656,340, Oct. 20. Aromatic alkene copolymers.

POLYMERIZATION. G. F. d'Alelio (to Koppers). U.S. 2,656,341, Oct. 20. Polymerization of acrylonitrile.

POLYMERIZATION. A. N. DeVault (to Phillips Petroleum). U.S. 2,656,398, Oct. 20. Polymerization of ethylene with palladium oxide catalyst.

FASTENER. R. W. Beaver and C. P. Sweeny (to Electro-Plastic Fabrics). U.S. 2,656,541, Oct. 27. Flexible thermoplastic fastener.

EXTRUSION. G. E. Barggren (to Western Electric). U.S. 2,656,566, Oct. 27. Plastic extrusion apparatus.

MOLDING. W. A. Venus (to Hahn and Kolb). U.S. 2,656,567, Oct. 27. Heating cylinder for injection molding machine.

MOLDING. A. S. Watkins and G. L. Warsak (to Produx). U.S. 2,656,568-9, Oct. 27. Injection molding apparatus.

RESISTORS. E. F. Harmon and P. J. Franklin (to U.S.). U.S. 2,656,570, Oct. 27. Plastic matrix for printing resistors.

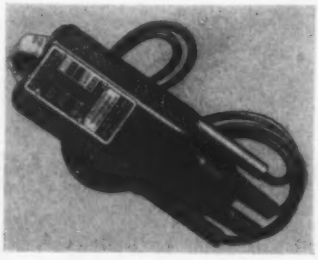
WHEEL TRIM. J. S. Judd (to Lyon). U.S. 2,657,099, Oct. 27. Transparent plastic trim for use on automobile wheels.

RESINS. D. W. Young and R. G. Newberg (to Standard Oil). U.S. 2,657,185, Oct. 27. Blends of elastomers with modified phenolic resins.

VINYL RESINS. D. X. Klein and M. N. Curgan (to Heyden). U.S. 2,657,186, Oct. 27. Polyvinyl chloride composition.

ADHESIVES. J. L. Evans and D. D. Micucci (to Du Pont). U.S. 2,657,187, Oct. 27. Hot-melt bookbinding adhesives.

THE S & F SHOWCASE



The two extruded cellulose acetate tubes in this Voltage Tester (manufactured by the Wigginton Company for Square D) are a product of Schwab & Frank, Inc., Detroit, makers of component plastic parts.

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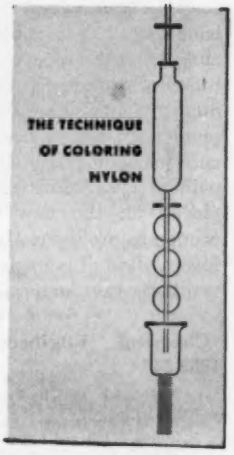

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BOOKS AND BOOKLETS

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"Organic Protective Coatings," edited by William von Fischer and Edward G. Bobalek.

Published in 1953 by Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. 387 pages. Price $7.50.

The increasing use of paint as an engineering material has made an over-all summary on the subject of protective coatings desirable. The present volume constitutes such a survey. Emphasizing the problems of formulation, specification, and application, the book presents the fundamental theory and practice of physics and chemistry as applied to coatings technology. In addition to background information, there are chapters describing typical case histories of progress in the coatings industry (anti-corrosive, luminescent pigments, aminoplast resins, hot spray lacquers, emulsion and latex paints, etc.). Particular stress is placed on the new technical and economic problems that arise when formulation of paint is based on new synthetic raw materials.

"Chemical Engineering Catalog 1953-54"

Published in 1953 by Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. 1957 pages. No charge in the United States and Canada if volume is returned when new edition is published. Price $3.00 for permanent purchase.

The 38th annual edition of this reference catalog of the chemical process industries provides information on equipment, engineering and raw materials, chemicals, and supplies offered by more than 515 participating companies, with most companies presenting their entire applicable lines. Six indices simplify the use of this catalog; these are: company names, (lists alphabetically names of firms appearing in the catalog); functions (lists items of material or equipment in terms of major groupings, to avoid guesswork as to the index term corresponding to any particular object of a search); equipment and materials of construction (lists suppliers by product, together with catalog page on which each listing appears); plants and specialized services (lists, by page, suppliers of services, equipment, or material for specific types of plants, as well as firms offering such services as custom-fabrication of equipment, testing, etc.); pilot plant index (lists manufacturers, designer, builders, fabricators, and used equipment dealers offering services, equipment, or supplies to pilot plant management); and tradename index (lists manufacturers, and pages on which their products are cataloged, by brand or trade name).

"Plastics Progress 1953"

Published in 1953 by Iliffe & Sons Ltd., Dorset House, Stamford St., London S. E. 1, England. 439 pages. Price 50s (ca. $7.00).

This book, based on the papers presented at the British Plastics Convention in June 1953, is an up-to-date report on several important branches of plastics technology, with special emphasis on glass and asbestos reinforced plastics. Stress is also placed on the composition, properties, fabrication, and uses of polyvinyl chloride. Developments in the field of melamine resins, polyamides and polyesters, and silicone resins, as well as molding problems, such as the economics of large moldings and factors involved in high-quality injection molding, are also covered. Four chapters deal with new uses of plastics in industry, viz.: cables, vacuum coating, conveyor belting, and footwear. Finally, the problems of selling plastics to the public are treated in a series of papers on tableware, toys, and design.

Airplane fabrics—A line of woven materials designed specifically for use in aircraft is summarized in this 4-page folder. Among the listings is Vinyon N, (a vinyl resin fiber for use in acoustical insulating blankets, exterior control surfaces, interior headlining, trim cloths, headrests, waste baskets) and Dynel (a fiber made from a copolymer of acrylonitrile and vinyl chloride and used in aircraft interiors, linings for instrument and goggle cases, and filter cloths). *Flightex Fabrics, Inc., 93 Worth St., New York 13, N. Y.*

Design handbook—How to design parts to be machined from glass-bonded mica is the subject of a "how to do it" instruction book entitled 'From One Designer to Another." The 22-page booklet contains tables, specifications, charts, and workbench sketches, and information on sizes, shapes, inserts, tolerances, holes, threads, contours, profiles, and grades. *Mycalex Corp. of America, Clifton, N. J.*

Aircraft reinforced plastics—Facilities for the production of contoured airframe sections and dies and molds for fibrous glass reinforced products are illustrated in this 8-page brochure. The operations include three-dimensional duplicating, profiling, milling, drilling, turning, and boring. A plan view of the company's factory, showing the location of the various machines, is also included. *MPM, Inc. 9110 George Ave., Cleveland 5, Ohio*

Plastic pipe—A line of flexible and semi-rigid plastic pipe is described in this catalog. In addition to furnishing tables of chemical resistances and estimated safe working pressures for both types, the catalog also contains sections on applications and installation. *Republic Steel Corp., 3100 E. 45th St., Cleveland 27, Ohio.*

Timing instruments—Catalog GEA-5965 presents the company's line of time switches, process timers, and time meters, giving the major features, applications, specifications, and modes of operation for each instrument. Prices are listed. *General Electric Co., Schenectady 5, N. Y.*

Asbestos—Of special interest in this 84-page "Handbook of Asbestos Textiles" is a section dealing with asbestos cloth, which finds application as reinforcement in molded and laminated plastics. The remainder of the booklet treats of general properties of asbestos, with particular emphasis on those types used in textile manufacture. There are also sections describing the processes by which asbestos is converted into finished textile products, as well as listings of A.S.T.M. specifications and test

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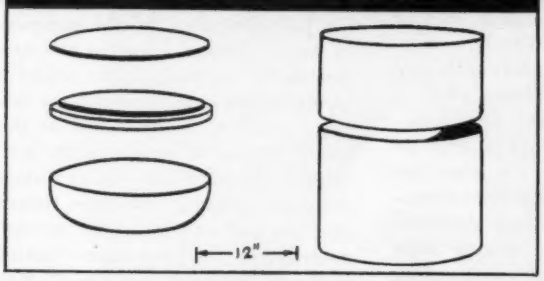
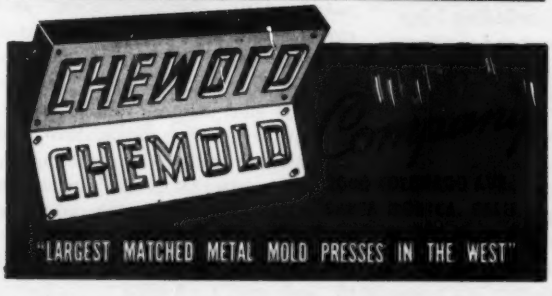


The Chemold Company is presently equipped to mold glass fiber polyester parts like those shown above and below. In addition to flat or ribbed sheets 32" x 96"; other compound curvature shapes may be produced 3' wide by 8' long, or 6' wide by 6' long using Chemold's 200-ton steam-heated hydraulic presses.



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applicable to asbestos. Price $1.00. *Asbestos Textile Institute, School of Ceramics, Rutgers Univ., New Brunswick, N. J.*

Duplicating patterns — Characteristics of Calcerite-A, a basic material for the preparation of duplicating patterns for Keller or Gorton duplicating machines, are discussed in this 3-page process bulletin. Step-by-step procedures for the preparation of duplicating patterns using this material are outlined and several variations (e.g., reinforcing) on the basic method of preparation are given. *Furane Plastics, Inc., 4516 Brazil St., Los Angeles 39, Calif.*

Coater—Reverse roll coater designed for high speed coating of lacquers, vinyl solutions, organosols, rubber formulations, and the like on a variety of webs including latex saturated paper, glassine, cellophane, plastics, etc., is described in this 2-page bulletin. The coater employs a separate transfer roll running in a color pan to apply an even coating; final metering of coating is accomplished between metering and backing rolls, the metering roll being continuously cleaned with a flexible steel doctor blade. *John Waldron Corp., P.O. Box 791, New Brunswick, N. J.*

Plastic sheet—This manual for product designers and fabricators presents an over-all evaluation of Boltatron, a low pressure plastics material which can be formed, sheared, sawed, dinked, punched, drilled, bolted, riveted, sanded, cemented, sewed, printed, and hot stamped. The 74-page book gives property tables; operating and service characteristics; methods of fabricating, forming, and molding; finishing procedures, and a special section of design notes. *Bolta Products Sales, Inc., 151 Canal St., Lawrence, Mass.*

Fluid power equipment — Bulletin 10051-C lists a complete line of fluid power pumps, motors, transmissions, cylinders, and valves, including 1-hp. variable delivery pumps and constant delivery duplex pumps for pressures up to 500 p.s.i. *The Oilgear Co., 1576A W. Pierce St., Milwaukee 4, Wis.*

Abrasive—Production and applications of silicone carbide are discussed in this 52-page survey of the compound. The booklet, after presenting a brief historical sketch of the discovery of the compound, proceeds to cover such subjects as formation, appearance and properties, preparation and grading of silicone carbide grains, and various applications. In the section on applications it is pointed out that, although silicone carbide is primarily known as an abrasive, its scope of uses is considerably larger, and includes increasing use in the manufacture of such products as refractory and super-refractory cements, electric heating elements, resistors, porous media, catalyst carriers, and deoxidizers. The booklet includes an extensive bibliography. *The Carborundum Co., Niagara Falls, N. Y.*

Molds—Description of manufacturing processes used by the company in the production of regular and special molds for the plastics industry (from design engineering to the finished product) is contained in this richly illustrated booklet. Also outlined is the work done by its casting division in making beryllium copper cavities and cores, using vacuum, centrifugal, or pressure casting methods. *Standard Tool Co., 75 Water St., Leominster, Mass.*

Fine fibrous glass—How to improve the efficiency of a variety of products and reduce their manufacturing cost by the use of extra fine fibrous glass is the subject of a 16-page booklet entitled "Possibilities Unlimited." Ideas on how to apply this type of fibrous glass as thermal or acoustical insulation in the transportation, storage equipment, machinery, and building construction fields are given. Tables of specifications and properties are also provided. *Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo 3, Ohio.*

Densified wood—Physical properties, specifications, and available thicknesses and weights of Hi-Den, a laminate of birch veneers impregnated with phenolic resin and pressed and cured under elevated pressure and temperature, are detailed in this 4-page folder. The material is said to have high density, strength, resistance to moisture, and dimensional stability; it finds applications in aircraft propellers, strain insulators, handles, industrial table and bench tops, architectural hardware, and clarinets. Also contained

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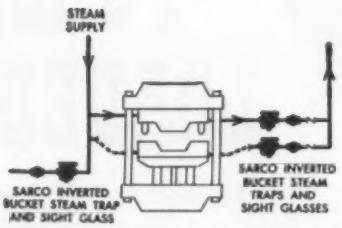
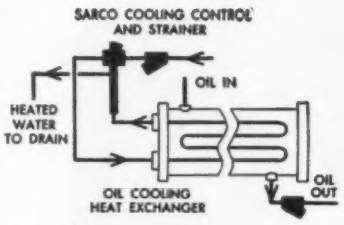
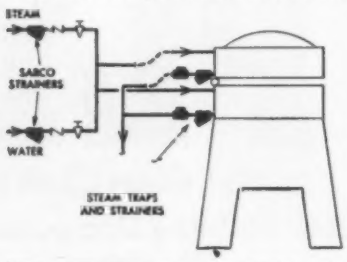


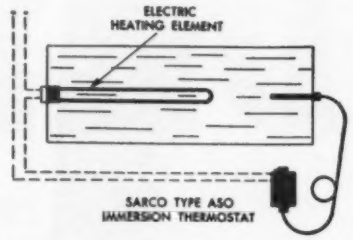
Compression molding press fitted with Sarco Inverted Bucket Steam Traps, the blast discharge of which scours the heating surface of the platens.



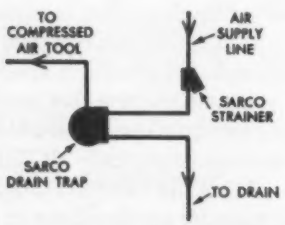
Heat exchanger cools hydraulic oil of plastics molding machines. Temperature of the cooling water is regulated by the Sarco Cooling Control.



Sarco steam traps on a steam-heated and water-cooled molding press.



Annealing bath temperature controlled by Sarco type ASO electric immersion thermostat.



Sarco Type F.A. trap draining small line to compressed air tool.

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in the folder are information on fabricating methods for this material and several end-product photographs. *Parkwood Laminates, Inc., 24 Water St., Wakefield, Mass.*

Chemical company—The history, operations, and products of Italy's largest chemical concern are handsomely presented in this 76-page book. Chapters deal with the company's activities in the mining and processing of a variety of basic chemicals (sulfur, chlorine, alkalies, and many others) and outline a host of chemical intermediate and end products manufactured by the company. A chapter on research and personnel activities is also included. The book is illustrated with many excellent photographs and contains a number of effectively designed process diagrams. *The Montecatini Group; Milan, Italy. Book is available in the United States from Montecatini's General Representative in the United States and Canada, Chemore Corp., 21 West St., New York 6, N. Y.*

Stabilizer—Properties imparted to plastisols and organosols by stabilizer 1203-X are described in Technical Bulletin 37. This stabilizer, in addition to giving heat and light stability, is also said to provide good air releasing characteristics, viscosity control, freedom from copper staining, and dispersibility. Bulletin 37 also contains a tabulation of physical data for the stabilizer. *Ferro Chemical Corp., P. O. Box 349, Bedford, Ohio.*

Standard—Printed edition of General Purpose Vinyl Plastic Film, Commercial Standard CS192-53, effective for new production on May 22, 1953, contains specifications covering methods of test and requirements of general purpose plain or embossed vinyl plastic film for thickness tolerances, yield per roll, width tolerances, shrinkage at elevated temperatures, contamination, appearance, cracking, tensile properties, tear resistance, volatility of plasticizer, water extraction, low-temperature impact, and flammability. Price 10¢. *Supt. of Documents, Government Printing Office, Washington 25, D. C.*

Hydraulic presses—Bulletin 5004-A catalogs the company's complete line of presses for plastics molding, die

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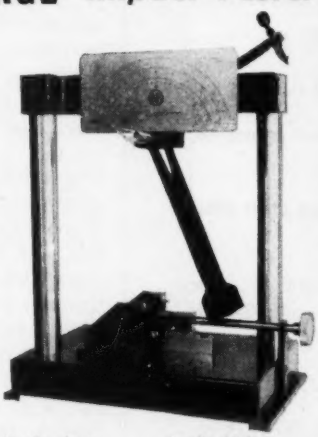

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MOSINEE
makes fibres work for industry

casting, and metal working. Included are injection molding machines, compression molding presses, transfer molding presses, and presses for molding reinforced plastics. Photograph, application notes, types available, and specifications are given for each. *The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.*

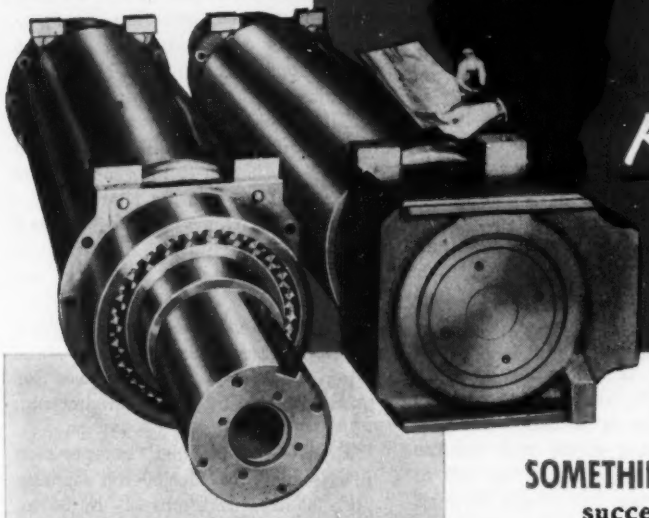
Design service—Case histories of successful product designs developed by the company in such diversified fields as typewriters, vacuum cleaners, pens and pencils, fountain service equipment, vending machines, counter displays, cosmetic dispensers, and many others are described and illustrated in "Product design; inspiration for management." The brochure also points out the importance of product style, and outlines the services offered by the firm in their creation. *Lippincott & Margulies, Inc., 500 Fifth Ave., New York 18, N. Y.*

Motor chart—Comparative listings of old and new N.E.M.A. standard dimensions for A.C. motors from 1 to 30 hp., intended as reference for determining differences in frame dimensions, are listed on 18- by 24-in. wall chart. Motors covered include polyphase squirrel-cage, polyphase wound-rotor, single-phase foot-mounted, flange-mounted, drip-proof, and fan-cooled types. *Westinghouse Electric Corp., 401 Liberty Ave., Box 2278, Pittsburgh 30, Pa.*

Dispersion resins—Typical uses, properties, and methods of applying vinyl resin-base organosols, plastisols, and plastigels are outlined in 8-page booklet VE. Fifteen application case histories are presented, including dish drainers, overshoes, anatomical models, carpets, dolls, and metal chair coatings. *Bakelite Co., a Div. of Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N. Y.*

Fatty alcohols—Technical bulletin 903-A presents information about the chemical structure and composition, reactions, applications, and solubility of the company's line of standard Adols, as well as on new Adols and Unadols recently introduced in pilot plant quantities. *Chemical Products Div., Archer-Midland Co., 2191 W. 110th St., Cleveland, Ohio.*

Anti-Friction Mill Roll Bearings



ADAMSON Roller-Bearing PLASTICS MILLS

Fifteen years ago, it was realized by pioneer plastics manufacturers, that the problem of stock contamination and high temperatures must be solved. Recognizing these problems, this type mill was developed with the aid of the B. F. Goodrich Company and the SKF Bearing Company. Many improvements have been made by those contributing to the original design, but today, the basic design remains practically the same. *Every pound of Koroseal* material requiring the use of mills is processed on Adamson Roller-Bearing Mills.*

Write us for complete mechanical and production data.

SOMETHING NEW? NO! In continuous and successful operation since 1938.

WHERE? IN ALL B. F. GOODRICH PLANTS where *Koroseal** material is processed.

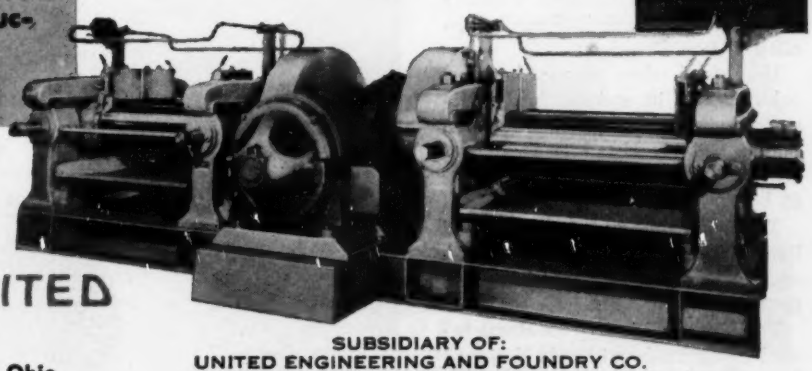
WHY? Because of their ABSOLUTE CLEANLINESS . . . Freedom from Contamination . . . Low Maintenance where High Temperatures are Necessary.

HOW? By use of SKF ROLLER BEARINGS WITH SPECIAL PISTON RING SEALS . . . Tilting Stock Guides . . . Removable Stainless Steel Stock Pans, and other Special ADAMSON Features.

*REGISTERED TRADE MARK OF B. F. GOODRICH COMPANY

Close-up of Swinging Stock Guide

22 x 60 Twin Mill Unit with Roller Bearings



ADAMSON UNITED COMPANY

730 Carroll Street, Akron 4, Ohio

SALES OFFICES IN PRINCIPAL CITIES

SUBSIDIARY OF:
UNITED ENGINEERING AND FOUNDRY CO.
PLANTS AT:
PITTSBURGH • VANDERGRIFT • NEW CASTLE
YOUNGSTOWN • CANTON

NEW MACHINERY AND EQUIPMENT

Test Equipment—A new Model FGT type SR-4 universal testing machine, introduced by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa., is said to be capable of testing — when equipped with suitable accessories — specimens of structural parts and components when in tension, compression, and flexure, as well as while subjected to alternating reversed loads, creep, stress relaxation, torsion, and shock.

The machine, which has a capacity of 50,000 lb. in tension and compression, uses SR-4 resistance wire strain gages for load measurement and features an SR-4 type stress strain recorder as standard equipment.

A new load cycling system makes it possible to adjust control points by two load indicating dial knobs to any two loads between 50,000 lb. compression and 50,000 lb. tension. Loads are applied to the bottom platen by a single reversing power screw from a variable speed electric motor. Maximum power stroke is 8 inches.

The indicator gage has four ranges: 0 to 50,000 lb., 0 to 10,000 lb., 0 to 2500 lb., and 0 to 1000 pounds. An additional four ranges are available by use of an SR-4 universal load cell, with which measurements can be made down to ⅛ ounce.

All testing can be done within a single opening, since load can be applied in two directions.

Horizontal clear space between columns is 21 in. and standard maximum vertical opening between platen and crosshead is 24 inches. Working space on the tester table is 20 by 20 inches.

The company guarantees a load indication accuracy of ½% of load, or 0.1% of scale, whichever is greater.

The Model SRA-1 strain stress recorder, although primarily designed for use on the FGT, can also be used with other models of the firm's testing equipment.

Standard 50-yd. rolls of chart paper are used in the magazine type drum of the recorder. Maximum strain recording speed is 1½ in. per second.

Clamp Accessory — Redesigned bushing for the company's series 210, 228, 230, and 240 production toggle clamps is intended for use under repeated stress and volume operation in the range from 500 to 800 p.s.i. It runs full length through the clamp bar to provide more bearing surface. Unlike earlier models, the new bushing is serrated and locked in the clamp bars to prevent turning and loosening. Detroit Stamping Co., 327 Midland, Detroit 3, Mich.

Calender—Designed for the production of two-ply laminated material and double coating of tire cord, a 28- by 78-in. Z-type calender, operating at speeds up to 240 ft. per min., has been engineered by Adamson United Co., Akron, Ohio.

All four rolls of the calender are of the peripherally drilled type, and are drilled for "triple-pass" circulating-water temperature control. The two offset rolls have motorized crossed axis equipment for skewing them in the vertical plane to compensate for deflection. Exact position of roll boxes is controlled by push-buttons.

The machine is driven by a separate pinion stand which encloses a double-reduction bull gear, pinion set, and all connecting gears.

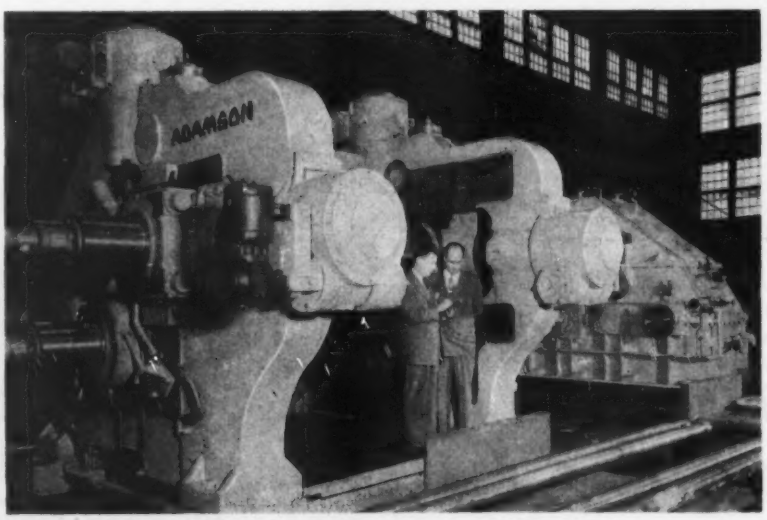
Replacing the previously used bronze slippers, universal spindles of the anti-friction bearing type are used to drive the calender.

The same calender design, with a single crossed-axis roll and some other modifications can be used for producing plastics film and sheeting.

Press — Low-cost compression press which provides 50-ton capacity with 30-in. stroke and 24- by 36-in. platens has been engineered by Sheridan-Gray, Inc., Aircraft Div. of T. W. & C. B. Sheridan Co., 405 Via Chico, Palos Verdes Estates, Calif. Platens may have increased width, but depth is limited.

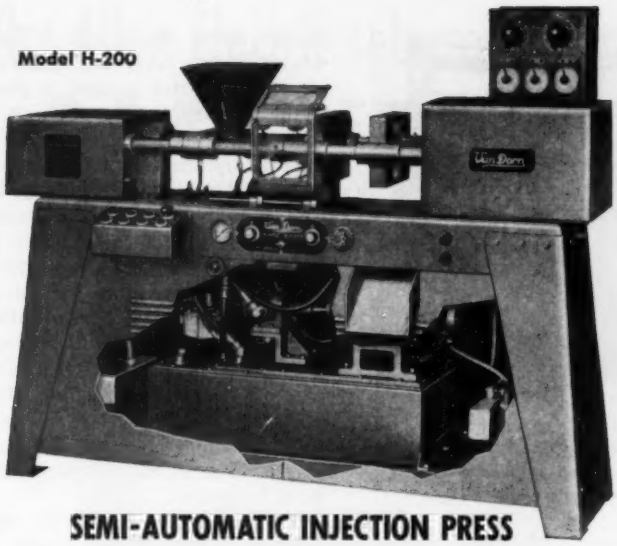
According to the company, savings in manufacturing costs have been gained through a low-cost frame design which still gives ample strength and accuracy.

The presses can be operated singly or in battery from a central pumping unit. Hydraulic power supply need not be mounted on press, but can be located in any convenient spot. The press is also available in air-hy-



Adamson United 28- by 78-in. Z-type calender operates at up to 240 ft. per minute

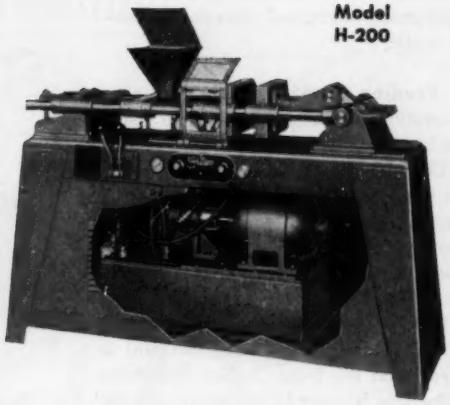
Model H-200



SEMI-AUTOMATIC INJECTION PRESS

2-oz. capacity. Van Dorn's engineering experience has scored again with this leader among all injection presses of its class. Its ultra-modern design insures faster operating cycles—up to 6 per minute. Push button controls are safe, simple and convenient. Accurate temperature regulation. Ruggedly built, compact and quiet.

Model H-200



Power Operated, Lever Controlled Presses—Available in 2-oz. or 1-oz. models. These profit-makers feature: Rugged all-welded construction; built-in safety devices; heating chamber with ample plasticizing capacity.

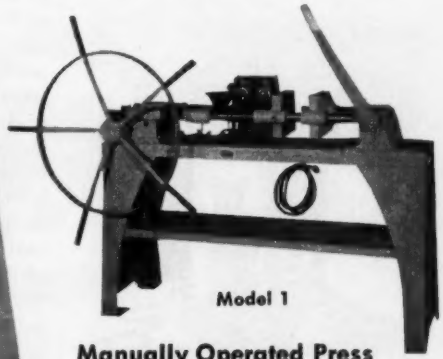
VAN DORN
Plastic Equipment

COSTS LESS to Buy...to Operate!

Van Dorn presses are *unexcelled in efficiency* and *unequalled in economy* on the innumerable jobs where a 2-oz. injection is ample. Costwise, Van Dorn presses are outstanding for these reasons:

1. **Surprisingly low in price**
2. **Operate 8 hours for a few dollars**
3. **Use less expensive molds**
4. **Easily set up by one man in a few minutes**

These presses mold practically all thermoplastics including nylon . . . Look over the Van Dorn presses and plastic equipment shown—*then write for detailed Bulletins on individual machines.*

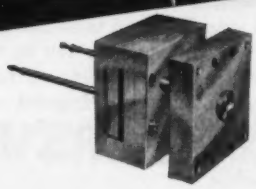


Model 1

Manually Operated Press
1-oz. capacity. Ideal for smaller jobs, experimental work, training.

Plastic Grinder
Grinds up rejects, waste, etc., for re-use. Ruggedly made, easily cleaned.

Model G-100



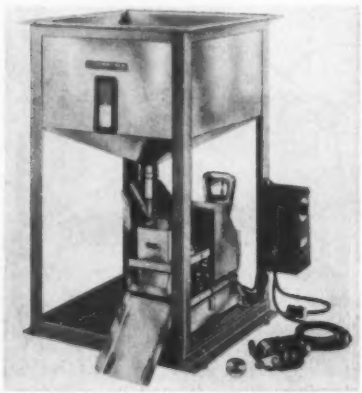
Mold Bases
. . . Available from stock for all Van Dorn presses.

THE Van Dorn IRON WORKS CO.
2687 EAST 79th STREET • CLEVELAND 4, OHIO
Cable Address: "VANDORN" Cleveland

draulic power models. Controls are optionally electrical, manual, or automatic.

Feeding Device—Installed atop injection molding machines in place of the normally used hopper, Model 213-F-00-IM Net Weighing Machine is designed to weigh-feed predetermined charges of molding material to the injection machine feed chamber. The unit is offered by The Exact Weight Scale Co., Columbus 8, Ohio.

In operation, molding material is fed from the 3-cu. ft. Net Weighing Machine hopper to its feeder trough. The vibratory feeder trough delivers the exact amount of material into an automatic weigh bucket. The feeder is synchronized with the ram

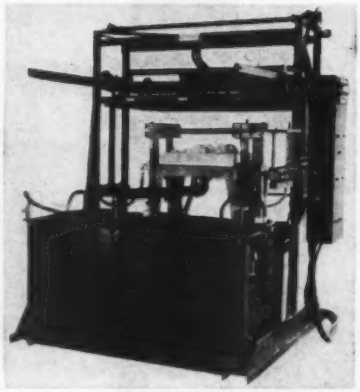


Exact Weight Scale's Model 213-F-00-IM feeds predetermined weight charges of material to molding machine

cycle of the injection machine. The weigh bucket fills to the predetermined weight and holds the material until the ram trips a switch, at which time the material is dumped into the injection feed chamber.

The weighing scale of the unit is of the balanced lever type, employing a weigh platter and notched beam with sliding poise; the indicating dial shows 1 in. of travel for 1 oz. of weight.

Vacuum Forming Machine—Model 50-20 vacuum forming machine, developed by Vacuum Forming Corp., Port Washington, N. Y., can be operated either manually or on a semi-automatic cycle by means of electrical switch components. It has a frame capable of drape-forming a



Vacuum Forming Corp.'s Model 50-20 can be operated either manually or on semi-automatic cycles

thermoplastic sheet up to 40 by 60 in. in size. The heater assembly used on the equipment consists of Chromalox strip heaters that produce temperatures up to 1150° F., which contributes to a short cycle. The table of the machine is arranged for tilting to assure all parts of the sheet to be uniformly heated. If the table is not tilted, the heater assembly, in its travel, would be over the back part of the sheet for a longer period of time than over the front part. Tilting the table makes the distance between heater and back part greater than between heater and front part. Thus, by proper adjustment of the tilt, all parts of the sheet can be made to pick up the same number of B.T.U.

Specifications for Model 50-20 are as follows:

Maximum sheet size (in.)	52 by 24
Heater type	Chromalox strip heaters
Temperature range	to 1150° F.
Height adjustment	up to 36 in. above table by means of worm and pinion gear
Timers	Overall cycle, clamp, heater carriage, vacuum valve

Winding Equipment—Two machines, one for winding and the other for unwinding webs on printing presses and in processes running glassine, cellophane, and acetate have been developed by Dilts Machine Works, Div. of The Black-Clawson Co., Fulton, N. Y.

The Surfastart Continuous Winder is designed for continuous winding of rolls without stopping press to change cores. As a roll is being wound, a new core, with pressure-sensitive adhesive applied, is placed in the primary arms of the unit. As the winding roll nears completion, the primary arm assembly is indexed forward, bringing the new core into contact with the sheet on a center drum. The web is severed on the drum, and the adhesive picks up the cut end and starts the web on the new core. Starting of new rolls is said to be possible at full operating speed. The completed roll is removed while the new one is winding. Model SSW handles cores of 3-in. I.D.; rolls up to 500 lb. can be wound to diameters of 6 to 24 in. with webs of 20 to 40 inches.

The Ferrisplice Unwinder makes continuous roll changes during unwinding operation possible. As a roll is expiring, a new roll is loaded in the upper position on the machine and held a short distance away from a center drum. The edge of the new roll is applied with pressure-sensitive adhesive or tape. At time of splicing, the operator actuates an air valve, which allows the new roll to drop onto the drum and come up to speed. The edge of the new roll is automatically spliced to the expiring web, and a cut-off knife severs the expiring web. The new roll is then raised off the drum and continues to unwind. The company states that roll changes at speeds over 400 ft. per min. have been made without loss of registration. Model FSU-A accommodates rolls ranging from 9 to 24 in. O.D., Model FSU-B those with 8 to 18 in. outside diameter. Maximum roll weight handled by the units is 500 pounds.

Marking Machine—Imprinting of plastics panels and other flat objects up to ¾ in. thick is accomplished at a rate of 80 impressions per min. by Model 45AE marking press, designed by Markem Machine Co., Keene 40, N. H.

The machine, which stands 50 in. high and occupies a floor space of 36 by 50 in., automatically feeds objects to be imprinted into the printing section and ejects them at the same rate. The feed table has adjustable side gages which can be moved to accommodate objects up to 5 by 14 inches. Maximum imprint area is 2 5/16 by 6 11/16 in., and may be located anywhere within an area of 5 by 11 inches.

Why Allen Electric selected *shock-resistant* G-E RUBBER-PHENOLICS for this battery tester case

Four-part case for the Cell-Chek, a unique battery tester made by Allen Electric and Equipment Company, Kalamazoo, Michigan, is molded of shock-resistant G-E 12487 woodflour-filled rubber-phenolic.

A battery tester leads a rugged life. Subject to constant handling in auto repair shops and garages, in constant contact with engine parts, its case must be *extra strong*.

That's why Allen Electric and Equipment Company selected a General Electric rubber-phenolic compound with which to mold the plastics case of its unique Cell-Chek battery tester. G-E rubber-phenolics provide the high impact strength required in this "rough service" application.

G-E rubber-phenolics also help Allen build other important sales features into its product: excellent dielectric properties, light weight for easy handling, black-satin finish for attractive appearance.

How can G-E rubber-phenolics help YOU?

Shock-resistant G-E rubber-phenolics offer you an excellent opportunity to use plastics for heavy-duty applications. They produce parts which resist breakage in assembly and service, accommodate large metal inserts without cracking, and permit lightweight designs without reinforcement. Where can *you* use them? Ask your molder about these amazing impact materials or send the coupon for a newly expanded case history brochure.

You can put your confidence in

GENERAL ELECTRIC

General Electric Company
Section 414-1A, Chemical Division
Pittsfield, Massachusetts

Please send me a free copy of "Design File—G-E Rubber-Phenolics." I want this information for: ( ) Reference purposes only ( ) An immediate application on _____

Name _____

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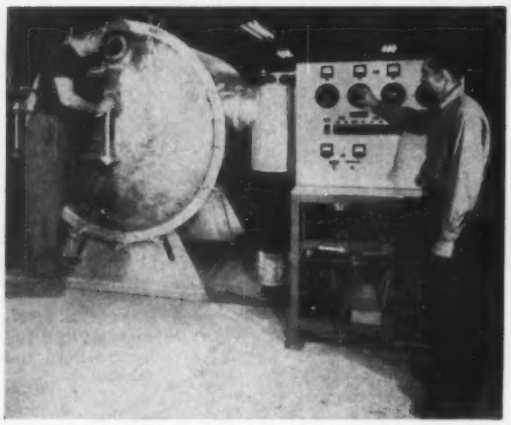
City _____ Zone _____ State _____

P-6 METALLIZER

An industrial metallizer capable of handling any vacuum metallizing job. Available in a large range of sizes for laboratory and industrial use.



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Telephone: GArfield 3-9008

NYLON BEARINGS
guarantee smooth sailing

Thousands of baby coaches roll along on nylon bearings molded by A. L. Hyde Presses from 4 oz. to 200 oz.

A. L. HYDE
GRENLOCH, N. J.
Established 1932
Member of Plastics Pioneers
Southern Office: R. L. Carroll • Greenville, S. C.

Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant, for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION IN
From Statistics Compiled

	Materials
CELLULOSE PLASTICS:[a]	
Cellulose acetate and mixed ester:	
Sheets, under 0.003 gage	
Sheets, 0.003 gage and over	
All other sheets, rods, and tubes	
Molding and extrusion materials	
Nitrocellulose sheets, rods, and tubes	
Other cellulose plastics	
PHENOLIC AND OTHER TAR-ACID RESINS:	
Molding materials[a]	
Bonding and adhesive resins for—	
Laminating (except plywood)	
Coated and bonded abrasives	
Friction materials (brake linings, clutch facings, and similar materials)	
Thermal insulation (fiber glass, rock wool)	
Plywood	
All other bonding and adhesive uses	
Protective-coating resins, unmodified and modified except by rosin	
Resins for all other uses	
UREA AND MELAMINE RESINS:	
Textile-treating and textile-coating resins	
Paper-treating and paper-coating resins	
Bonding and adhesive resins for—	
Plywood	
All other bonding and adhesive uses, including laminating	
Protective-coating resins, straight and modified	
Resins for all other uses, including molding	
STYRENE RESINS:	
Molding materials [a]	
Protective-coating resins, straight and modified	
Resins for all other uses	
VINYL AND VINYL COPOLYMER RESINS, total[b]	
Polyvinyl chloride and copolymer resins (50 percent or more polyvinyl chloride) for—	
Film (resin content)	
Sheeting (resin content)	
Molding and extrusion (resin content)	
Textile and paper treating and coating (resin content)[c]	
Flooring (resin content)	
Protective coatings (resin content)	
All other uses (resin content)	
All other vinyl resins for—	
Adhesives (resin content)	
All other uses (resin content)	
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS	
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:	
Molding materials [a,d]	
Protective-coating resins[e]	
Resins for all other uses[f]	

* Dry basis is designated unless otherwise specified.
† Revised. †† Partially estimated.
[a] Includes fillers, plasticizers, and extenders. [b] Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production are given. [c] Includes

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

POUNDS" FOR SEPTEMBER AND OCTOBER 1953
by U. S. Tariff Commission

September		*October*	
Production	*Sales*	*Production*	*Sales*
1,557,083	1,634,144	1,916,529	1,787,488
1,295,161	1,335,382	1,204,556	1,235,640
535,168	517,090	543,281	540,294
7,393,023	7,534,182	7,477,955	7,333,558
644,255	536,032	649,941	575,283
427,069	434,492	441,119	504,311
19,147,823	17,646,575	19,556,598	17,481,948
6,882,093	4,333,978	††6,645,125	††4,417,240
1,107,993	1,024,327	862,156	899,311
1,712,890	1,298,382	937,358	1,145,322
1,327,482	1,550,264	1,184,253	1,237,418
2,868,088	2,568,080	††3,226,259	††2,887,127
2,750,983	2,705,154	††1,470,427	††1,433,001
2,168,689	1,900,408	††2,412,603	††2,099,150
2,468,493	2,070,077	††2,446,013	††1,882,599
2,349,445	2,289,019	††2,338,206	††2,522,289
1,818,534	1,726,037	††1,590,491	††1,906,797
4,183,464	4,045,903	3,810,161	4,081,200
3,067,460	3,250,670	††3,975,833	††3,958,297
2,407,923	1,980,864	††2,932,094	††2,130,354
5,591,144	5,085,894	5,906,150	6,099,645
†25,666,302	25,181,589	††21,255,505	††24,442,280
7,565,277	8,349,473	††5,820,953	††5,720,763
7,140,530	5,751,320	7,500,116	6,422,477
40,381,397	38,066,365	41,170,006	41,505,351
—	5,317,708	—	5,568,229
—	4,854,987	—	5,081,327
—	9,484,871	—	10,218,783
—	4,281,316	—	4,542,371
—	2,072,678	—	2,279,469
—	1,947,512	—	1,707,031
—	2,283,626	—	2,941,157
—	1,999,628	—	2,048,770
—	5,824,039	—	7,118,214
14,337,461	15,023,609	17,201,173	17,227,265
13,095,290	11,637,410	15,602,120	11,325,496
638,121	397,711	††812,902	††482,462
8,959,452	9,832,137	9,368,205	9,880,880

data for spreader and calendering-type resins. [d] Includes data for acrylic, polyethylene, nylon, and other molding materials. [e] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective coating resins. [f] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

PLASTIC MARKING

Stamp Names, Trademarks, etc. right in your own shop with the *Precision Built* Kingsley Machine

Simple, easy to use. No skilled operators necessary.

Write us about your marking requirements. Send a sample or dimensions of parts to be stamped. We'll reply air mail with complete details on how a Kingsley Machine can be applied to your specific problem.

UP TO 1000 STAMPINGS PER HOUR

Uniform, clean-cut impressions in gold or any color.

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Keep Pace with an

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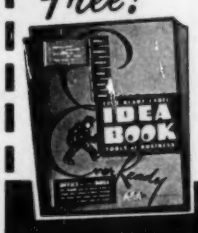
Free!



Ever Ready is in the forefront of labeling development, collaborating closely with leading manufacturers in the paper, plastics, adhesives and related industrial fields . . . improving standard lines and developing new ones. Every facility, mental and mechanical is here at your service. There is no label problem that can't be solved at EVER READY. That's the challenge . . . accept it please!

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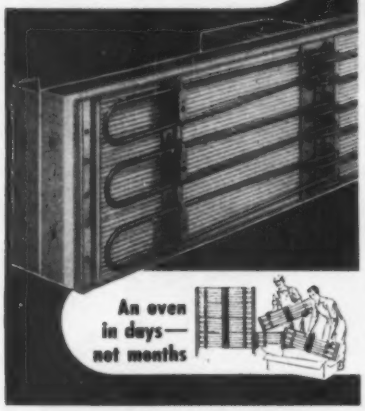
For BAKING, CURING, DEHYDRATING, etc. on an efficient, production line level



An oven in days—not months

CHROMALOX

Electric

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Ready to install, 1-ft. x 4-ft. and 2-ft. x 4-ft. pre-engineered Chromalox Panels generate intense, far-infrared energy to meet many processing and finishing heat needs. Tunnels in sizes to fit the work, can be quickly assembled in minimum space. Color-blind far-infrared radiation is absorbed efficiently by all colors and textures, can be controlled precisely, and gives other advantages possible with no other heat source!

Send For Bulletin CS-605

It gives details on pre-engineered Chromalox Electric Radiant Panels and shows how they meet your heat requirements.

Radiant Heating Division 18-39-A
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THE paint-baking cycles to which automobile bodies are subjected on the assembly line are being used to advantage for fusing and curing a Geon vinyl plastic weather sealant at Ford Motor Co. plants.

The vinyl plastic, smooth-flowing yet putty-like when applied, fuses later into a pliable material which, it is claimed, will not crack during the life of the car. The formulation has good adhesion to bare metal and flows easily without dripping.

With the automobile moving along the assembly line, the plastic is applied by means of air guns into the drip-guard rail around the top of the vehicle, around the window shield frame, and along the trunk.

Following this application, the whole car body, including the plastic, is spray-painted with a prime coating and subjected to baking; the plastic partially fuses during this operation. Next, the car—and the plastic—are sprayed with a coat of enamel and sent to the final baking oven. Here the paint is hardened and the plastic is completely cured. Thus the curing cycle is completed without a separate heating cycle simply by taking advantage of the baking operations which the car body would have to undergo for purposes of paint hardening alone.

CREDITS: Geon vinyl plastic by B. F. Goodrich Chemical Co.

Vinyl sealant is applied by means of air guns to car on assembly line

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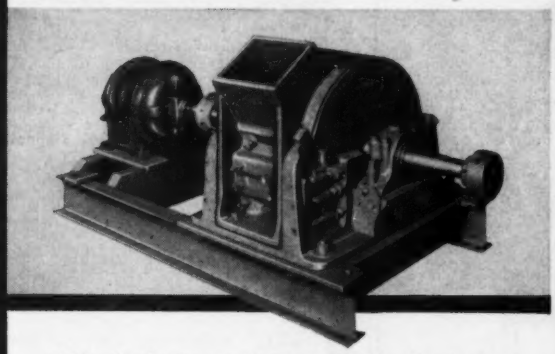

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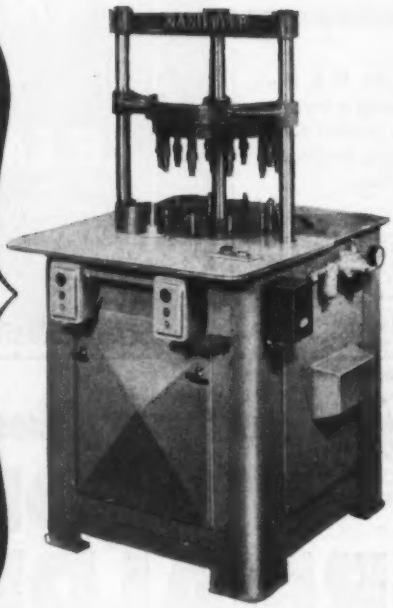

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Carrying case for medical diagnostic instruments is molded of nylon

Nylon Case

MOLDED nylon has been adopted as a replacement for wood in protective cases for carrying delicate diagnostic instruments.

In contrast to the old-style thin wooden cases, the new molded nylon model is designed to better meet the requirements of the medical practitioners using the instruments. Although light in weight, the nylon case has high impact strength through a wide range of temperatures, is resistant to abrasion, and will not chip under conditions of normal usage.

From the standpoint of maintenance, the nylon case is also more practical than the wooden one. It is resistant to most chemicals, can be sterilized by any of the accepted solutions, and will not discolor. A molded rubber liner—which replaces the easily soiled, hard-to-clean velour lining in the wooden case—fits snugly into the bottom of the nylon model and can be easily removed for cleaning or sterilization. If desired, the rubber lining may be cemented in place; even then, it is still easier to clean than velour.

The attractive nylon case, which is available in black trimmed with chrome-plated brass, is currently designed only for packing an otoscope-ophthalmoscope instrument set. Based on the success of this nylon case, however, company officials predict that in the future other instruments for eye, nose, or throat examination will be provided with similar containers.

CREDITS: Case molded by Watertown Mfg. Co., Watertown, Conn., for National Electric Instrument Co., Inc., Elmhurst, N. Y.

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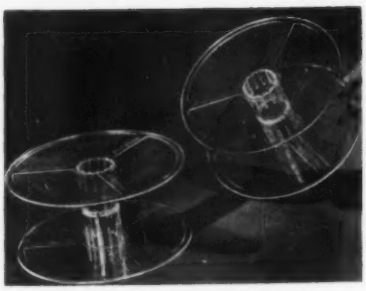


First reel designed to accommodate 3 in. wide tape is molded of styrene

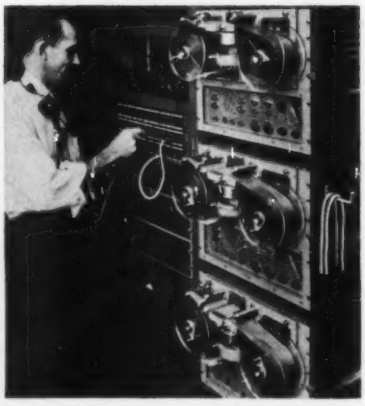
Styrene Reel

TAPE reels, molded of heat-resistant styrene, contribute to the success of a new magnetic tape recorder engineered for 24-hr. continuous recording unattended by an operator. According to the manufacturer, styrene was chosen for the 7-in. diameter reel—the first reel designed to accommodate 3 in. wide tape—because of dimensional stability, clarity, and the savings made possible in production and assembly operations. Frequency range of the equipment is from 400 to 3800 cycles, with a 40-db. signal-to-noise ratio.

Since, in addition to continuous operation, the unit can also record two channels simultaneously on one roll of tape, it is suitable for such commercial applications as air-to-ground communication recording, radio program monitoring, and police broadcast copying.

CREDITS: Recorder manufactured by The SoundScriber Corp., New Haven, Conn.; reels molded by American Molded Products Co., Chicago, Ill.

Two channel recording makes unit suitable for ground-to-air applications



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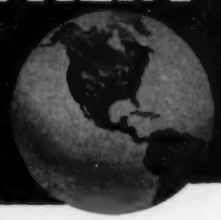

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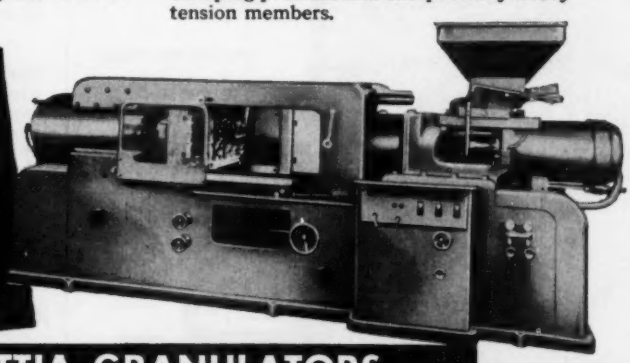
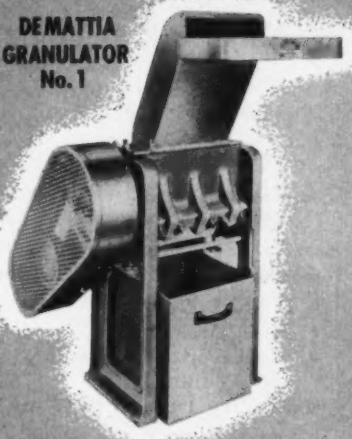


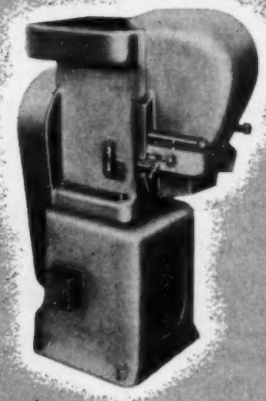
DE MATTIA GRANULATORS

DE MATTIA GRANULATOR No. 1



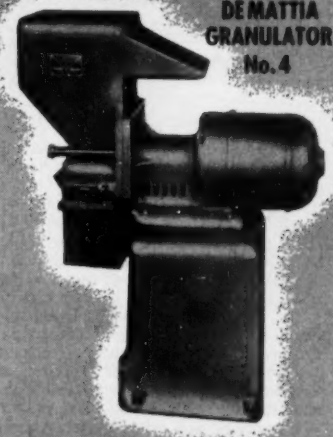
A simple, rugged and highly efficient granulator. Processes 200 lbs. per hour. Floor space required — 32" x 44"; net weight with motor — 600 lbs. apprux. Features high grade roller bearings with positive seal.

DE MATTIA GRANULATOR No. 3



Salvages large chunks from heating cylinder, nozzle accumulations and tough molded pieces. Floor space — 32" x 18" x 45" high; net weight including motor 750 lbs. Heat treated alloys steel rotor.

DE MATTIA GRANULATOR No. 4



Especially recommended for installation along side the molding press. Available with or without base. Overall dimensions — 34" long, 12" wide, 23½" high (from bench). Hopper opening — 9" x 4½"; net weight 375 lbs.

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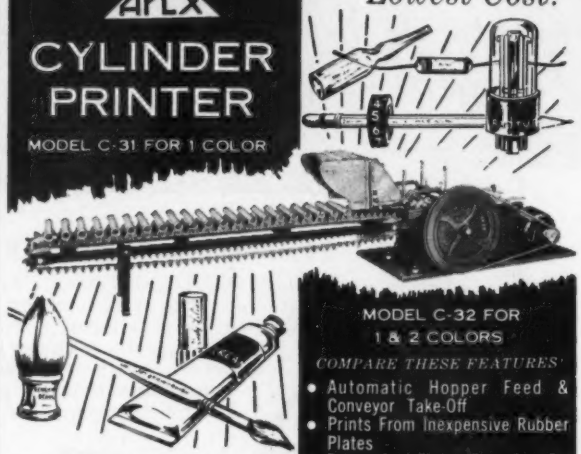

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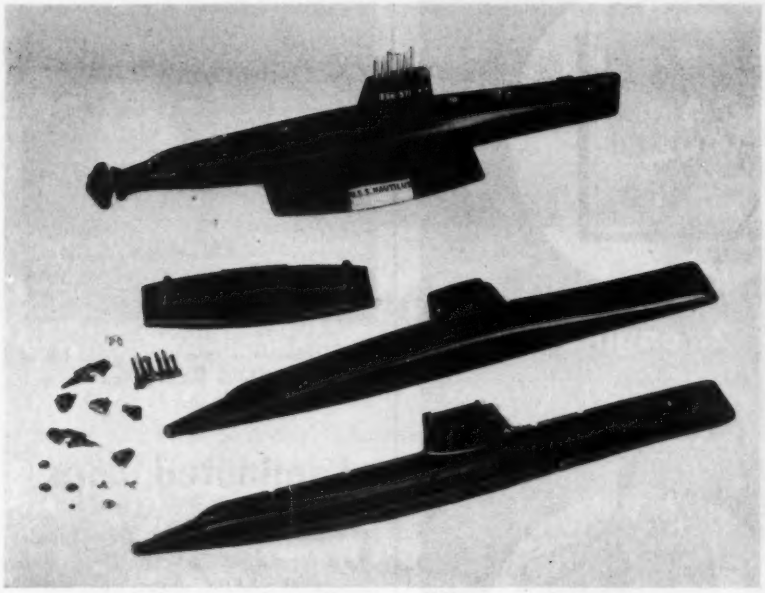

Scale model of *U.S.S. Nautilus* — Navy's first atom-powered submarine — can be assembled by hobbyists from molded styrene parts designed from Navy Dept. blueprints

Precision Parts for Construction Kit

BY combining precision engineering of plastics parts with an intensive merchandising campaign, ready-to-assemble construction kits of many kinds have been promoted into one of the fastest selling groups in the hobby field. (See "Molded Acetate Hobby Kits," MODERN PLASTICS *31*, 189, Oct. 1953).

Latest—and most timely—addition to this group is a new kit of styrene parts that can be assembled in less than half an hour into a handsome model of the *U.S.S. Nautilus*, the Navy's first atom-powered submarine.

In designing and molding the styrene parts for the sub, care was taken to insure the authenticity of the completed model in every detail. Official blueprints were obtained from the Navy Department and photographically reduced to the exact size of the contemplated hobby kit. Skilled model makers then translated these reduced blueprints into actual scale models that were used as guides for machining the steel cavities.

With the exception of a clear styrene housing located on the top front of the conning tower, a complete set of parts, including an attractive exhibition stand for mounting the assembled model, are molded in one shot. As soon as the parts are removed from the mold, they are immediately packaged in printed folding boxes using special fixtures located right at the injection molding machine.

When completely assembled, the *Nautilus*, although measuring less than 13 in. in length, is remarkably accurate in detail. The model includes finely detailed radar equipment, attack periscope and snorkel, deck grooving, stabilizers, simulated torpedo ports, hatch covers, and propellers—all molded in the same natural blue-grey color of a submarine. Several of these parts, however, such as the periscope and radar equipment, can be realistically painted with metallic silver by the model maker.

Another recent entry in the model ship field is a kit that assembles into a reproduction of the *U.S.S. Missouri*. Like the submarine, all the styrene parts are one-shot molded on a 12-oz. machine.

With leisure time constantly increasing in the United States and with more and more Americans becoming hobby-conscious, the future for the plastics hobby kits continues to look bright.

CREDITS: Hobby kits manufactured by Revell, Inc., Venice, Calif., using styrene supplied by The Dow Chemical Co. Injection machines are Impco.

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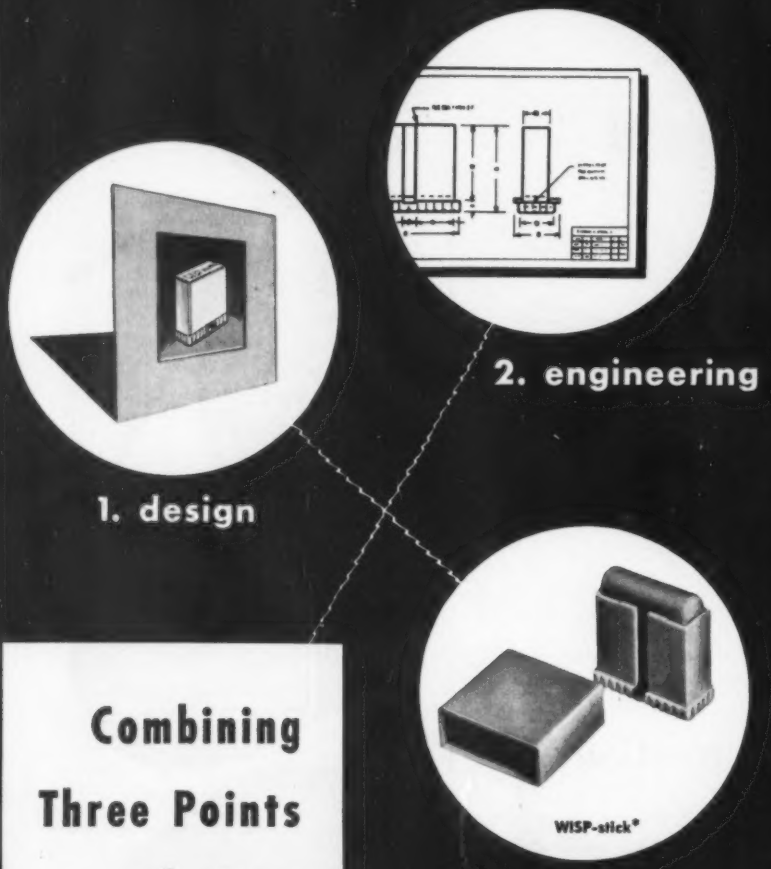

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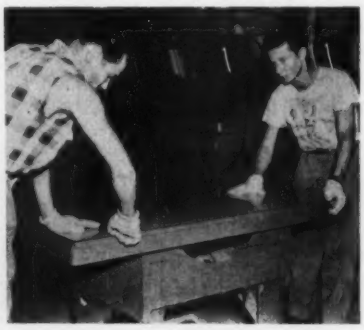
CREDITS: Office furniture by General Fireproofing Co., Youngstown, Ohio; Textolite tops by General Electric Co., Pittsfield, Mass.; adhesive by Armstrong Cork Co., Lancaster, Pa.

Guides are removed from side of desk top after laminate has been adhered



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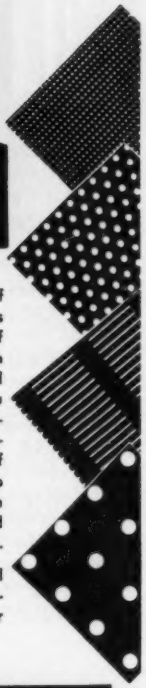

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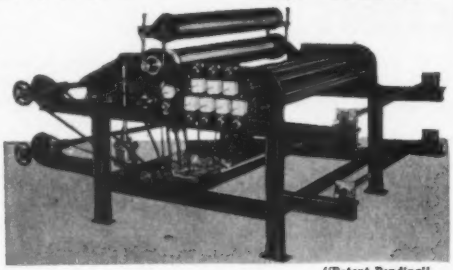
It is designed for non-stop operation, having both dual let-off and take-up stands. Pressure is infinitely adjustable to suit the roll being used, by air pneumatic pistons, each individually controlled. The variable speed drive runs the unit at 6 to 42 yards per minute. The cooling system is a new type atomized spray, which needs no messy pans or squeeze rolls to take off surplus water. The chromed roll and engraving rolls are internally cooled.



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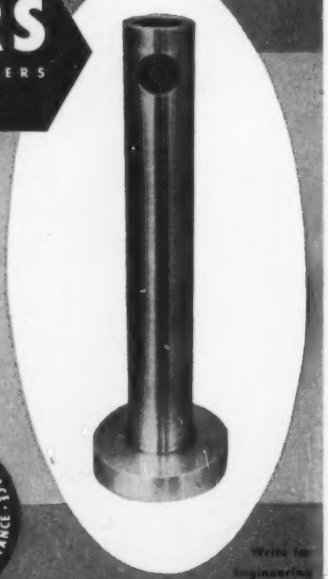

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'Sandwich' Wall

(*Continued from p. 87*)

finish, and ready for mounting. To color the outside of the tank without adding separate finishing operations to the simplified production process, the wooden mold is coated with a silvery-pigmented polyester resin overlay before the fibrous glass is laid up. Then, as resin is applied to the fibrous glass, the overlay adheres to the resin-impregnated surface, providing an attractive finish for the tank at the same time as the tank is being molded.

All that is now necessary before the tank can take to the road is to bolt on the running gear substructure and the manhole cover, attach the outlet valves, and hook up the lights. Even some of the electrical wiring for these lights is molded in place as an integral part of the tank. Dust covers, as well as the bumper, for the tank trailer, are molded separately of reinforced plastics.

The total weight of the molded plastics tanks is only 7000 lb., compared to the 11,000- to 14,000-lb. weight of steel tanks of comparable size. Mounted on the specially built Tructor-General Air Spring rear axle, the over-all height of the tank from the road bed is only 105 in. and its center of gravity is 3½ in. lower than in similar standard tank trucks.

The tank trailer is equipped with an electric brake system that works in conjunction with standard air brakes on the tractor. Both systems can be operated simultaneously from the brake pedal by the driver.

The tank, which was first introduced to the dairy industry at the end of last year, is already in service. While this particular model was designed under the sponsorship of the Dairymen's League Co-Operative Association specifically for the transportation of milk, it has attracted a great deal of attention in other fields. Because of its sandwich construction and the exceptional strength of reinforced plastics, the tank can carry liquids with a higher specific gravity than milk.

CREDITS: Tank designed and molded by Insulation Associates, Inc., Fanwood, N. J.; polyester resin supplied by Celanese Corp. of America; fibrous glass supplied by Owens-Corning Fiberglas Corp.

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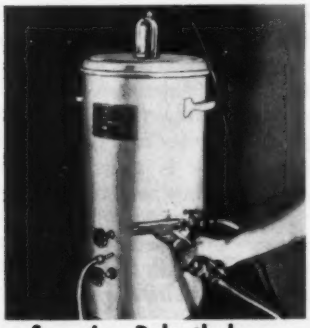

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Air Conditioners

(*Continued from p. 82*)

mand a better-looking, more highly-styled exterior cabinet.

6) Production economy—Because of the inexpensive tooling costs of the low pressure molding process, the reinforced plastics model can be retailed at approximately the same price as a comparable metal unit.

Most of the seven parts of the U. S. Air model are molded in 100-ton presses. For some of the larger pieces, such as the exterior cabinet, preforms are first made in a 6-ft. preform machine. Approximately 200 complete sets a day is the current rate of production.

The room air conditioning unit being made by Muntz also incorporates an exterior and an interior cabinet molded of reinforced plastics. Each of the cabinets is molded separately and then assembled on a steel structural frame into a single housing for the air conditioning mechanism. The interior cabinet, which measures approximately 11 in. deep, 14 in. high, and 25 in. wide, is molded with large openings on the front and two sides into which metal grilles are fastened. Control knobs for the operation of the unit are installed in a molded-in cavity on top of the interior cabinet.

The exterior cabinet, which is 4 in. longer than the interior half, is also molded with openings along the sides and back into which additional metal grilles are fitted. Toward the front edge of this part, a deep groove for the window sash is molded in.

The attractive fibrous pattern, in which the glass fibers are again accentuated, and the pleasant neutral grey color make the unit a handsome addition to home or office.

Now that reinforced plastics have secured a definite foothold in the air conditioner industry, future applications of the material look bright indeed. Considering that production of 2 million units—each a potential user of reinforced plastics—is predicted for 1954 alone, such a future promises to be a big and an important one.

CREDITS: U. S. Air model and Muntz models are both molded by Structurlite Plastics Corp., Hebron, Ohio, using H-P-M presses and Turner preform machine. Fibrous glass is supplied by Owens-Corning Fiberglas Corp; polyester resin is supplied by Pittsburgh Plate Glass Co.

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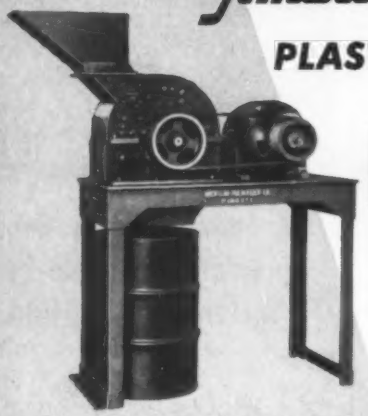

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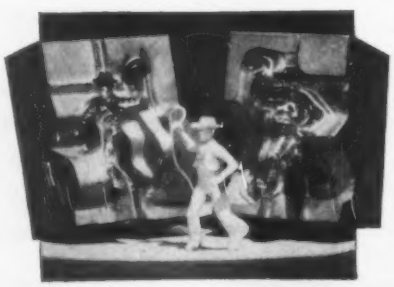

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Trays

(*Continued from p. 99*)

ascertained only through extended usage. Experience to date, however, indicates that long-time service may be expected from them.

The new reinforced plastics trays are produced in matched steel molds operating at 245° F., using fibrous glass mat and a high impact rigid type polyester resin. A wire reinforcement is incorporated to lend additional edge strength to each tray. Molding is done on a hydraulic press operating on approximately 50-ton capacity. A 240-grit finish is used on the molds, providing an exceptionally smooth tray surface.

How They Are Used

When the trays are in use, the newly formed gelatin capsules are spread in the trays as soon as they emerge from the capsulation machines. Next the trays are nested approximately six ft. high on a dolly and the stack is transferred to a drying tunnel, where they remain for a specified period, depending on the type of capsule. When new stacks of trays are pushed into the drying tunnel, a finished stack is automatically ejected into the inspection department, where capsules which fail to meet rigorous standards are removed.

After inspection in the drying trays, the capsules are transferred to dark colored "deep" trays, measuring 25 by 31 by 2¾ in. deep. The capsules remain in these trays, which are also molded of glass fiber laminate and contain a wire edge reinforcement, for succeeding operations until they are packaged. Gelatin Products now has 6000 of these trays in use, supplanting wooden trays which deteriorated in service and presented a personnel hazard in the form of rough edges and slivers after extensive use.

The two types of reinforced plastics trays adopted by Gelatin Products suggest the broad potential market for suitably designed trays and carriers in the pharmaceutical, chemical, and food handling industries.

CREDITS: Drying trays molded by Molded Fiberglass Tray Co., Linesville, Pa., using Fiberglas mat and Bakelite polyester resin. Deep trays produced by Plastics Div., Fabricon Products, Inc., River Rouge, Mich.

Honeycomb

(*Continued from p.* 104)

show indications of excellent filleting characteristics during cure. Satisfactory test panels have been produced where these adhesives have been applied only to the skins; on initial heating the resin softens and the surface tension causes the adhesive to form a fillet between the cell wall and the sandwich skin.

The thermosets that have been used in bonding panels to date fall into four general categories: 1) solvent-solution varnish type (liquid); 2) cloth supported resin (tape); 3) unsupported resin (film); and 4) 100% solids resin (liquid). According to sandwich fabricators who have worked with aluminum honeycomb, the best combination of peel and tensile strength can be obtained by using the tape adhesives or the unsupported adhesives reinforced with scrim cloth. In the latter case, the cloth imparts toughness to the skin bond.

The use of adhesives in tape or film form simplifies bonding procedures and aids in maintaining uniform high quality. Total weight of synthetic resin adhesive needed for panel bonding varies with the cell size of the honeycomb and with conditions to which the panel will be subjected in use. Typical adhesives run from 0.10 to 0.18 lb. per sq. ft. of panel.

New Applications

With these resin adhesive developments opening new doors for aluminum honeycomb core sandwich panels, a growing use of the material has been noted in many fields. In the aircraft industry, for example, honeycomb has moved into more prominence in the construction of primary structural parts such as ailerons, fins, rotor blades, and missile wings.

Truck and trailer manufacturers and container manufacturers have also found that the aluminum honeycomb cores afford them strong, light, and in many cases, relatively low-cost, core materials for structural uses.

Applications in the building industry include porcelain enamel exterior panels, light diffusers, spandrel panels, and doors.

The commercial market for both metal adhesives and the completed sandwich can be greatly enlarged by the development of the low cost metal adhesive displaying satisfactory properties and adaptable to material bonding methods.

Glass Faces

A recent development in bonding techniques makes possible a new and relatively inexpensive sandwich consisting of aluminum honeycomb faced on both sides with ordinary window glass. No core prime, tape, or film is employed in this bond; an epoxy resin is applied to the glass and a very effective fillet is formed when the resin softens during the initial stage of the cure cycle. This fillet may be clear or it can be tinted by adding a suitable dye to the initial resin formulation. The product is not only pleasing to the eye but also offers high impact strength, good bending, and edgewise compression strength; in effect, it makes a structural material out of ordinary window glass. The honeycomb stabilizes the glass so that it may be stressed as high as 40,000 p.s.i. before failure occurs. A decorative translucent polyester laminate can well be used in lieu of the window glass in this type of product. Contemplated uses include walls, partitions, doors, glazing, skylights, and table tops.

Cotton Fabric Cores

Cotton fabric honeycomb core materials are also in use and are manufactured in $\frac{7}{16}$-in. cell sizes using 8-oz. and 4-oz. cotton fabrics. Cotton fabric honeycomb, which provides the insulation of a non-metallic material at lower cost than glass fabric honeycomb, is produced in large blocks, up to 96 by 30 by 18 in., the 18-in. dimension being the through-the-cell dimension.

Whether in the form of glass fabric, aluminum, or cotton, honeycomb cores offer specialized properties for a versatile range of specialized applications. As the techniques of fabrication continue to be perfected and as adhesive and impregnation formulations, based on the synthetic resins, continue to be improved, sandwich structures are attracting the attention of more and more potential end users.

CREDITS: Preshaping techniques and HOBE developed by California Reinforced Plastics Co., Oakland, Calif.

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Conference

(*Continued from p.* 106)

processes available to the reinforced plastics industry, stressing the economics of each process, its advantages, etc.:

1. "Contact Molding," C. A. McGill, Lone Star Boat Manufacturing Co.

2. "Bag Molding," James Lunn, Lunn Laminates, Inc., and I. M. Scott, Winner Manufacturing Co.

3. "Matched Die Molding" will be discussed in the following categories:

a) "Injection Molding"—1) "Vacuum," George Lubin, Bassons Industries Corp.; 2) "Pressure," E. Y. Wolford, Koppers Co., Inc.

b) "Preform and Mat Molding," Sol Fingerhut, Zenith Plastics Co., and Samuel Oleesky, Micronics, Inc.

c) "Premix Compound Molding"—1) "Compression Molding," Roger B. White, The Glastic Corp.; 2) "Transfer Molding," Victor G. Reiling, Modern Industrial Plastics, Inc.

d) "Prepreg Molding," Lawrence Wittman, Cordo Molding Products, Inc.

4. "Continuous Laminating," Leonard S. Meyer, Consultant, Newark, Ohio.

5. "Continuous Extrusion," W. Brandt Goldsworthy, Industrial Plastics Corp.

6. "Potting," George Firth, McCulloch Motors Corp.

12:00 Noon—Luncheon

Presiding: Robert S. Morrison, Molded Fiberglass Co.

Principal speaker: E. James Premo, chief body engineer, Chevrolet Div., General Motors Corp., "The Corvette Plastic Body."

2:30 p.m.—Contact Period

Representatives of resin, filler, and reinforcement manufacturers, mold and machinery manufacturers, designers and consultants, and government representatives to remain in individual rooms.

7:30 p.m.—Annual Banquet

Toastmaster: Harold B. Freeman, American Cyanamid Co.

Friday, February 5

9:00 a.m.—Session

Presiding: Richard Malamphy, Naugatuck Chemical, Div. of U. S.

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Rubber Co. Recording secretary: Billy B. Curl, Flexfirm Products.

"To Conceal or Reveal—Special Fiber Treatments Can Produce Salable Effects," E. F. Bushman, General American Transportation Corp.

"Reinforced Plastic Tooling," Fred Lyijynen, Briggs Mfg. Co.

"Chemical Resistant Applications," S. W. Shepard, Chemical Construction Corp.

"Quality Control in Aircraft Plastics," H. S. Kraus, North American Aviation, Inc.

"New Evaluation Techniques for the Effect of Glass Sizings on Glass Reinforced Plastics," G. W. Bainton, Jr., C. J. Guare, and K. N. Mathes, General Electric Co. Turbine Div.

12:00 Noon—Luncheon

Presiding: John S. Berkson, Alsynite Co. of America.

"The Pattern of Our Progress," Hiram McCann, editor, MODERN PLASTICS magazine.

1:30 p.m.—Technical Forum

Presiding: R. J. Brinkema, R. J. Brinkema Co. Recording secretary: Samuel S. Oleesky, Micronics, Inc.

Panel will consist of representatives who delivered papers during preceding three-day session.

The following papers will be included in the preprint book *by title only:*

"A Review of the Industry Activity in Developing Reinforced Plastics Pipe," L. Repsher, Bakelite Co., a Div. of Union Carbide and Carbon Corp.

"Grinding Glass Fiber-Reinforced Plastics," R. T. Argy, The Carborundum Co.

"Silicone Release Agents for Organic Resins," C. C. Currie and W. C. May, Dow Corning Corp.

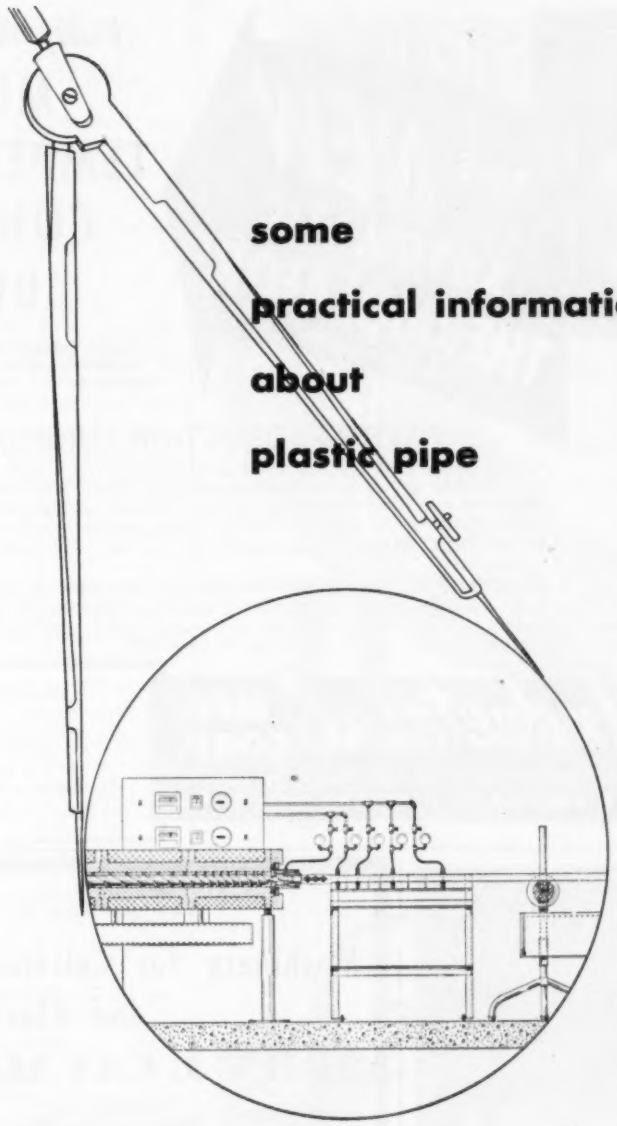
"Controlling Flow Properties with Fillers," J. R. Wilcox, Edgar Brothers Co.

"The Use of Tool Plastics for Cutting Costs in the Reinforced Plastics Industry," N. Mark Hastings, Rezolin, Inc.

"Parallel Glass Fiber Laminates and New Resin-Glass Bonding Techniques," Dr. J. D. Robinson, The Englander Co., Inc. and James W. Case, Navy, Bureau of Ordnance.

"A New Coupling Agent for Glass Fiber Reinforced Polyesters," Dr. Jesse H. Plummer, Glass Fibers, Inc.—END.

some practical information about plastic pipe



• In a plastic process unit you have these basic elements: extrusion; sizing; stress-relieving; cooling; cutting to length; inspection and packaging. In addition, there is also a reclaiming unit for rejected pipe.

Above you see an illustration of the heart of the plastic pipe processing unit . . . extruder with its die, sizing rings and take-off equipment. Herein lies the success or failure of the finished product.

To make plastic pipe, either rigid or flexible, you start with a choice of basic plastics. Today, there are several accepted basics, such as: modified polystyrene; butyrate; polyethylene and either rigid or semi-rigid polyvinyl chloride. Each of these plastics has specific qualities and individual characteristics. The type you use depends upon the end use to which the finished pipe is to be put.

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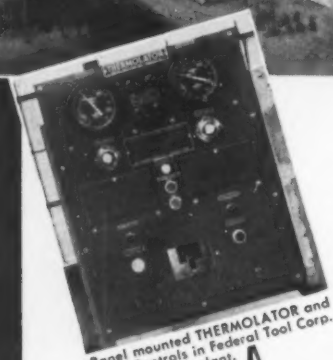

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Glass Bonding

(*Continued from p.* 109)

by changing the properties of one surface with a primer so that it will be compatible with the adhesive. A catalyzed B-stage phenol-aldehyde adhesive, for example, will not ordinarily stick to a glass surface. If, however, the glass is coated with a dilute solution of a silicate-vinyl-phenolic combination, a thin oriented film with non-polar characteristics is formed and adhesion becomes possible. Tensile tests demonstrated that over 1000 p.s.i. were required to separate the adhesive from the primer-coated glass surface, whereas 10 to 20 p.s.i. could separate the glass-phenol-aldehyde adhesive bond when no primer was used.

Likewise, a resorcinol-formaldehyde adhesive shows a very non-polar character (a 65° contact angle) and gives little or no adhesion to a clean plate glass surface. When two glass surfaces are coated with the primer described above, however, and joined together with the resorcinol adhesive, 800 to 1000 p.s.i. are required to cause failure of the adhesive bond.

• • •

This article is the third and final one in the series devoted to recent technological advances in synthetic resin adhesives.

From the standpoint of volume use, the three areas of application which have been discussed—wood, metal and glass—represent the largest actual and potential markets for the manufacturers of synthetic resin adhesives.

They do not, however, represent all the possible applications to which the adhesives can be adapted. Plastics, synthetic textiles, natural textiles, and rubber are some of the many other industries where joining problems have been solved with marked success by the application of synthetic resin adhesives.

In touching only upon three broad groups of adhesive applications, the aim has been to focus attention upon the entire family of synthetic resin adhesives—their outstanding properties, their adaptability to the complex manufacturing problems of many of today's industries . . . and their importance as a large-volume market for a wide and growing range of plastics materials.—END

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Elastomeric Part

(*Continued from p.* 111)

ducive to excessive flashing of the piece along the thin tapered edges. To offset this problem, the molder prepared a special wooden fixture on which the flexible piece is held firmly upon removal from the injection machine, so that the excess flash may be quickly trimmed by an operator using a razor blade type knife. The projecting nozzle section of the drain rail, molded by means of a loose core arrangement in the die, is cored with a $\frac{7}{16}$-in. drain opening. This spout-like extension is designed with a tapered collar at the point where it passes through the shell of the refrigerator. Molded in the tapered outer side of the collar is a narrow groove which mates with the opening in the metal back of the appliance, producing a tight, non-slipping assembly. Two cored openings in the drain rail, flanking the nozzle extension, permit the passage of assembly bolts which hold a metal plate against the rail at this point, anchoring it firmly in position. This fastening supplements the metal rails over which the rest of the rail is placed in the assembly process.

At the Seeger plant, installation of the vinyl plastic drain rail and tube is handled on a double assembly line. One man inserts a steel rod through the periscope-shaped spout and pushes it through the liner wall from the inside. A second man grasps the rod from the back of the cabinet, pulling the drain spout through the opening in the metal shell and drawing the rail itself up tight against the rear wall of the food compartment. The first operator then uses a rubber mallet to force the drain rail into its final position behind the metal cabinet strips. As the part is pounded into place, the undercut section, molded in the back of the rail, opens up and provides a tenacious grip on the specially designed metal fasteners which are completely concealed by the plastic rail in the final assembly.

CREDITS: Drain rail molded by Amos Molded Plastics, Edinburg, Ind., on Watson-Stillman injection machine, using Geon No. 80633 white elastomeric vinyl molding compound. Injection machine equipped with Thermolator mold temperature control unit made by Industrial Mfg. Corp., Indianapolis, Ind., and Injecto-Weigh weigh feeding unit made by Glengarry Equipment Corp., Bay Shore, N. Y.

S.P.E.

(*Continued from p.* 129)

are those in which the polymerizable groups are in the alkyl part and those in which the polymerizable groups are in the acyl part of the molecule.

Optimum properties and workable viscosities are obtained by using a monomeric mono-functional resin, such as styrene, vinyl acetate, or methyl methacrylate, as a copolymer. Monomeric poly-functional resins, such as monomeric diallylphthalate, may also be used as copolymers. Although all of the above copolymers are used, monomeric styrene is usually preferred since the over-all properties and ease of handling are considered to be superior. The concentration of copolymer used depends on the type of resin, working viscosity, and properties desired. Recently developed polyesters give good properties and are compatible in all proportions.

Color and specific properties such as high-heat resistance, fire resistance, toughness, etc., can be obtained through the use of fillers.

Polymerization of these resins is effected by means of any of a large number of peroxides and hydroperoxides. Each of these peroxides is most effective in different temperature ranges, which correspond fairly closely with the thermal decomposition point of the peroxide.

Peroxide catalyzed polyester resins can be cured either through the application of heat or by means of room temperature accelerators. No pressure is required and no volatile by-products are produced.

Polyester resins, including a new thixotropic resin, have been used to produce a great variety of products.

Tool Steels for Plastics Molds

Hugo C. Becker—Crucible Steel Co. of America

The quality of a molded part is no better than the quality of the mold in which it was produced. Therefore, the production of a quality molded part, as pertains to the mold, is the successful combination of certain factors: 1) mold steel quality and properties; 2) mold design; 3) mold building practice; and 4) mold operating conditions.

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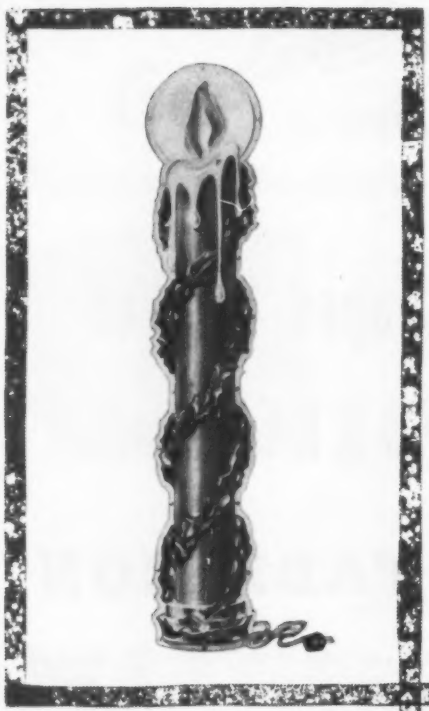

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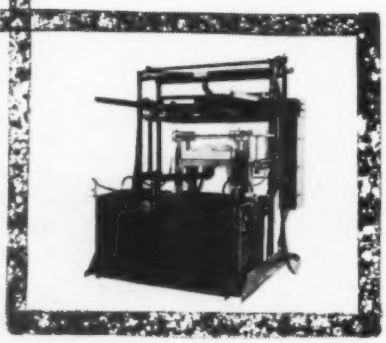

Raylite Electric Corp., N. Y. 51, N. Y. vacuum forms their electrically illuminated, multi-dimensional "Paramount" 42" high Christmas Candles from preprinted Vinylite sheeting. During the peak pre-Christmas season last year, Raylite could not afford to fool around—production on Christmas Candles and other seasonal items had to be high, with a minimum of slow-downs and rejected pieces. Their fully automatic VacForm machines gave them the outstanding output they needed.

At the right is the Model 50-20 which Raylite uses for vacuum forming. Thanks to the unique VacForm technique in which the heated plastic sheet floats in over a male mold and then is "drape formed," draws as deep as 10" are made without sacrifice of wall thickness, fidelity of detail, or production speed.

VacForm machines are *truly automatic*. Once the button is pressed to start the cycle, the machine attendant has nothing further to do. Every part of the forming operation is timed and actuated automatically.

These machines use low cost molds made of plaster, metal or wood. Production of pilot pieces for formed toys, packages, displays, or component parts often starts within 24 hours after conception of the product idea.

Full details about VacForm machines and the "drape forming" technique will be sent on request.

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the mold builder, the three factors of importance concerning tool steels for plastics molds are their production, distribution, and application.

The general quality of any steel is governed by its method of production. The melting, forging, mill heat treating, and inspection practices were discussed from the viewpoint of producing a tool steel of a quality suitable for plastics molds.

Once the steel has been produced, its value to the mold builder is nil unless it is readily available in the size required. In dealing with mold builders, we must operate under the basic distribution hypothesis that when steel is ordered, the job is already a minimum of one day late.

When the steel has been produced and made available, its value to the mold builder is governed by the proper application of the steel within the limitations of its physical and mechanical properties. The available types of hobbing grades, master hob grades, and machine-cut grades was briefly described, along with their application to compression and injection molds. Recommendations were made to mold builders concerning mold design, machining, heat treatment, and polishing.

Arcing Tests on Plastics

Thomas J. Martin and Raymond L. Hauter—Boeing Airplane Co.

Increasing concentration of electric power at higher voltages in the airplanes of today has made essential a review of the usage of insulating materials which, by their nature or their application, may constitute a fire hazard under abnormal conditions of circuit or equipment failure. Boeing's interest in this problem was stimulated by the occurrence of fires in the mock-up of a new electrical system in which phenolic limiter blocks burned with sufficient violence to burn holes in the supporting structure.

It was found that power arcs across the surface of the material produced results which were somewhat different from those produced by the standard A.S.T.M. test method. A new technique was developed for testing the materials in the presence of sustained electrical arcing to simulate a circuit failure.

A number of different materials have been tested, and tests are continuing for further evaluation of

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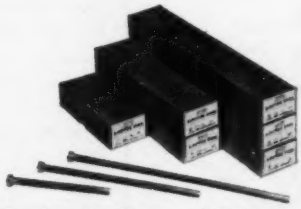

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arc-resistant materials. The results of tests made to date, which cover a range of materials from phenolics to glass-bonded mica and Teflon, were included.

Dry Blending of Vinyl Compounds

M. S. Greenhalgh—General Electric Co.

The technique of extruding dry blend compounds of polyvinyl chloride resins depends primarily on two types of processing equipment—the mixer or blender and the extruder. There has been considerable controversy concerning these two phases, particularly the latter. It is quite difficult to discuss the mixing equipment without taking into account in what manner the compound will be processed in the final operation. There are some who are of the opinion that if an extruder could be designed with better compound or fusing action than the present type, the actual mixing of dry blend stocks would be considerably simplified.

In considering the type of extruding equipment which is now being used, there are at least two additional items which must be taken into account. The first is the quality and production requirements of the product to be produced. The second is the type of formulation required to produce the product. In every-day blend operation, all these factors are dependent one on the other and none may be changed without affecting the overall set-up.

There have been numerous attempts to overcome certain objections to either the mixing or extruding process by altering the formulations used. Everyone is quite familiar with the dry blending claims made by the various resin suppliers for their particular grade of resin. The question of how far the development of superior dry blending resins can be carried may be in the same category as the ultimate design of an extruder-compounder. The effect of other compounding ingredients, such as plasticizers, stabilizers, fillers, etc., also must be considered in formulating for proper dry blend processing. From time to time there are reports that various processors have obtained better extruding results by using certain plasticizers in various amounts.

Therefore, in discussing the pro's and con's of the numerous types of

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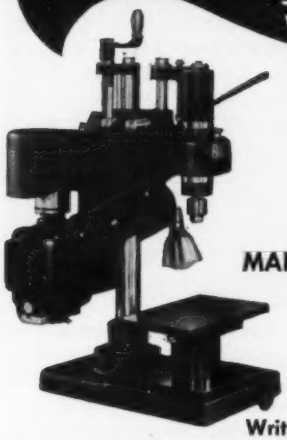

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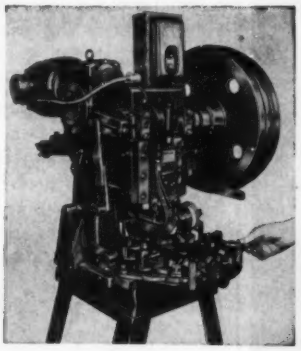

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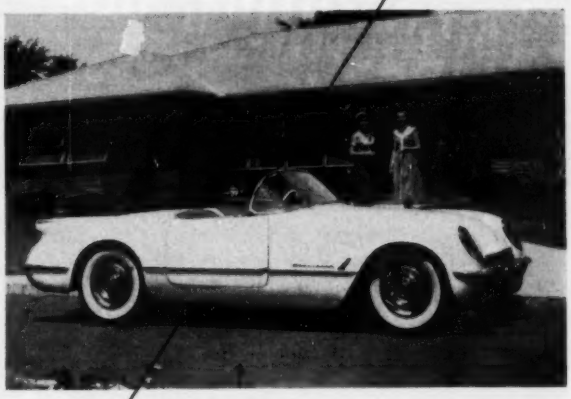

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mixing or blending equipment, we must bear in mind the extent to which the success of the operation is dependent on the factors mentioned.

Types of Extruders

Herbert O. Corbett—Auburn Button Works, Inc.

A comparison was made between electrically heated and oil heated extrusion machines as well as those machines equipped with d.-c. variable speed drives, mechanical variable speed drives, and mechanical step drives. It was pointed out that the type of drive selected depends greatly upon the type of operation the machine will be called upon to perform; that is, whether it will be used in a job shop or for long range continuous production. It was also pointed out that a company buying several machines would be wise to purchase units with similar drives for interchangeability.

It was stated that good tooling for an extruder permitted cellulosics and vinyls to be run from the same basic die design. The speaker explained the advantages of careful die design in helping to eliminate trial and error methods in obtaining a desired shape to exact dimensions. He further stated that the designer should also anticipate probable future shape changes when developing a basic die design.

In summarizing, the speaker pointed out the different factors involved when designing so called economical shape extrusion dies and when designing costly dies such as those needed for wide sheet or pipe. He completed his talk by explaining "How Not to Be an Extrusion Engineer" as seen through the eyes of the extrusion machine operator.

Cutting Costs With Quality Control

Dorian Shainin—Rath & Strong, Inc.

It is maintained that quality control can best serve any plant by reducing cost, while at the same time keeping quality standards high, or even improving them. Costs can be cut in engineering operations, production, and inspection.

The first step identifies the relative concentration of theoretically unnecessary costs in each of these categories by appropriate sub-classifications: 1) rejects—imperfect

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bond to inserts, cracks, bubbles, blisters, die marks, foreign matter, undispersed pigment, dimensional reject, etc.; 2) too much or too little inspection—each characteristic related to frequency of customer complaints and assembly difficulties; 3) dimensional tolerances that are too tight for economical manufacture, but which seem to be necessary to avoid assembly difficulties; 4) physical, chemical, and electrical property specifications that are tighter than the manufacturing process can meet.

By using a scale of dollars, the potential savings attainable by correcting relatively few sub-categories determine the program to be followed.

In the second step, statistical tools for correcting such situations were described. Simple examples were given for: a) knowing when a production process should be left alone and when it should be stopped for an adjustment to molding time, temperatures, pressures, raw material characteristics, etc.; b) the design of a simple series of economical experiments to find the effects of certain factors while holding other factors in a balanced or neutralized condition; c) use of the multi-vari chart to reduce the total variability of molding processes; and d) appropriate statistical sampling plans for economically discovering lots that are more defective than desired.

European Developments in the Extrusion Industry

E. Davey-Turner—R. H. Windsor Ltd., London, England.

Particular reference was made to the advantages of multiple screw machines, to the extrusion of flat sheet in readiness for the expansion of the vacuum forming method, and to the increasing demand for larger sizes of plastics pipes in almost all materials. The paper also covered some aspects of the extrusion of certain thermoplastic materials, together with comments on die design and take-off equipment.

Vinyl Paste Resin Dispersions—Today and Tomorrow

W. D. Todd—B. F. Goodrich Chemical Co.

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Viscosity, cps. at 0°C	193,000
21°C	3,800
70°C	74
Cloud Point	Below –92°F
Specific Gravity, 30/30°C	1.04
Refractive Index, 30°C	1.498

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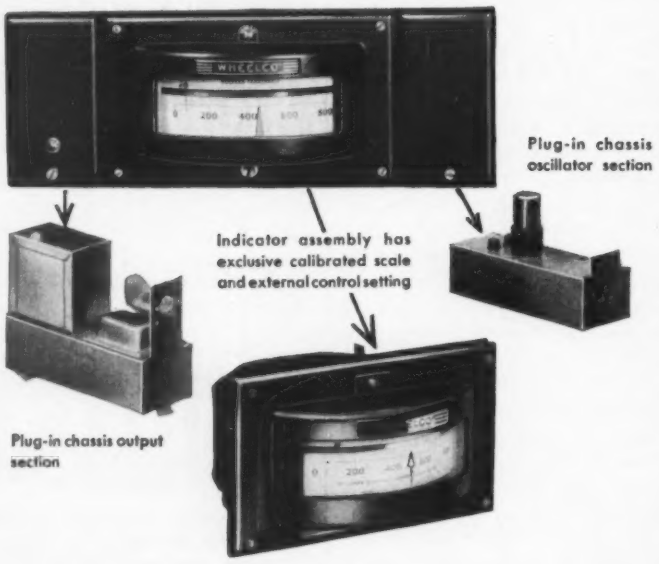
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The Mechanical Properties of Polyethylene

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A summary of some of the recent work on the mechanical properties of polyethylene was presented. The apparent modulus of elasticity of several molecular weight grades of polyethylene has been measured over the temperature range from −125° C. to +80° C. Other mechanical properties, such as stress and strain at the apparent "elastic limit," have also been evaluated.

Other Papers—The following papers, for which abstracts were not available at press time, were also presented: "Kralastic—a Polymer of Styrene-Acrylonitrile-Butadiene in Pipe Fittings," by Paul M. Elliott, Naugatuck Chemical Div.; "Present and Future Applications of Heat-Resistant, Modified Styrenes," by C. J. Snyder, Koppers Co., Inc.; "Liquid Polymers Combined with Epoxy Resins," by J. S. Jorczak and J. A. Belisle, Thiokol Chemical Corp.; "Professional Activities Report," by Dr. L. M. Debing, Monsanto Chemical Co.

In addition, at the Research Symposium, moderated by Bryce Maxwell, the following were discussed: "Crazing of Polystyrene," by E. E. Ziegler, The Dow Chemical Co.; "The Theory on the Changes in Physical Characteristics of Plastics Caused by Radiation," by J. W. Ryan, General Electric Co.; "Properties of Multiaxially Stretched Acrylic Plastics," by Irvin Wollock, National Bureau of Standards; "Adiabatic Extrusion," by McKelvey and Bernhardt, E. I. du Pont de Nemours & Co., Inc.—END

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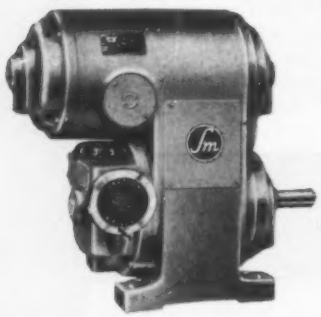

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(*Continued from p. 144*)

parity between the value of μ_s and s/p makes it evident that, besides shearing in depth, another mechanism must be involved. It would appear that some slippage occurs at the metal-plastic interface, because of the low adhesion between T.F.E. and steel. Hence the value of s/p = 0.42 corresponds to a condition of no slipping.

Effect of Halogen Atoms

Figure 2 demonstrates that the substitution of chlorine for fluorine atoms in polytetrafluoroethylene has a remarkably large effect on the coefficient of friction, and a rise of 4-fold in μ_s and 6-fold in μ_k occurs from the replacement of only 10% of the fluorine atoms. With 20% or more of chlorine substitution, "stick-slips" and tearing occur, and it is presumed that the adhesional force per unit area between plastic and metal has become greater than the bulk shear strength of the plastic.

Polytetrafluoroethylene, the 50-50 copolymer of tetrafluoroethylene and ethylene, and polyethylene form a series of linear polymers in which the fluorine atoms in polytetrafluoroethylene are replaced to the extent of 0, 50, and 100 percent. From these data, as plotted in Fig. 11, it is apparent that the replacement of fluorine by hydrogen atoms causes an initial and rapid rise in μ_s such that the values for 50% substitution are practically identical with those for 100 percent. Here the replacement of fluorine by hydrogen causes effects like those of replacing fluorine by chlorine, in that each causes an increase in μ_s. However, the initial slopes of Fig. 2 are much greater than that of Fig. 11.

The fact that Fig. 11 exhibits a steep slope at 0% hydrogen substitution but 0 slope at 100% substitution deserves explanation. A rather qualitative explanation can be given for this difference in slope.

The van der Waals force field from each atom in the surface of the plastic is highly localized and nearly zero at distances of an atom diameter. The adhesional effect of the surface atoms is like the effect of inserting one strong magnet in a two-dimensional array of weak magnets, all of the same orientation and strength. Obviously, a few strong magnets to every 100 weak ones will give a perceptible change in the net attractive field of this array; this explains the rapid curvature at 0% hydrogen substitution. When the system consists of an array of 100 strong magnets among which several weak magnets are distributed, there will result little change in the net attractive field of the array. In principle, this also explains the large slope at 0% chlorine in T.F.E. in Fig. 2 and the 0 slope at

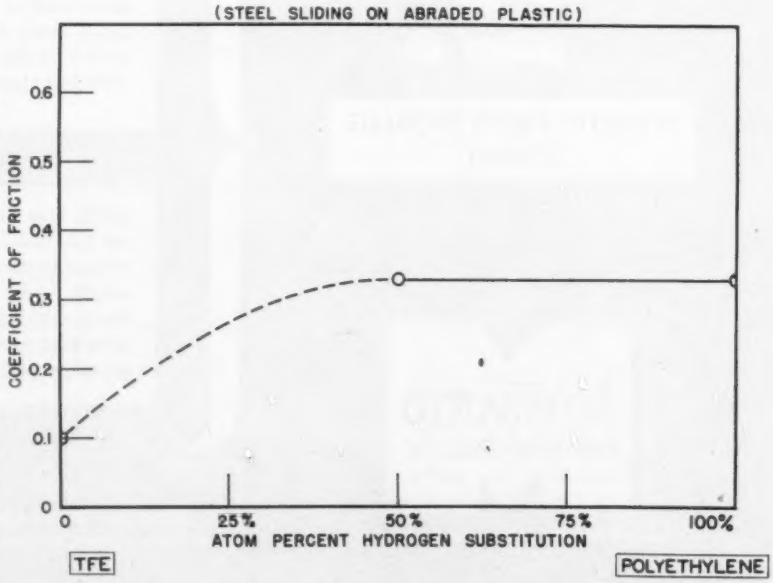

Fig. 11—Effect of hydrogen substitution on static coefficient of friction of T.F.E.

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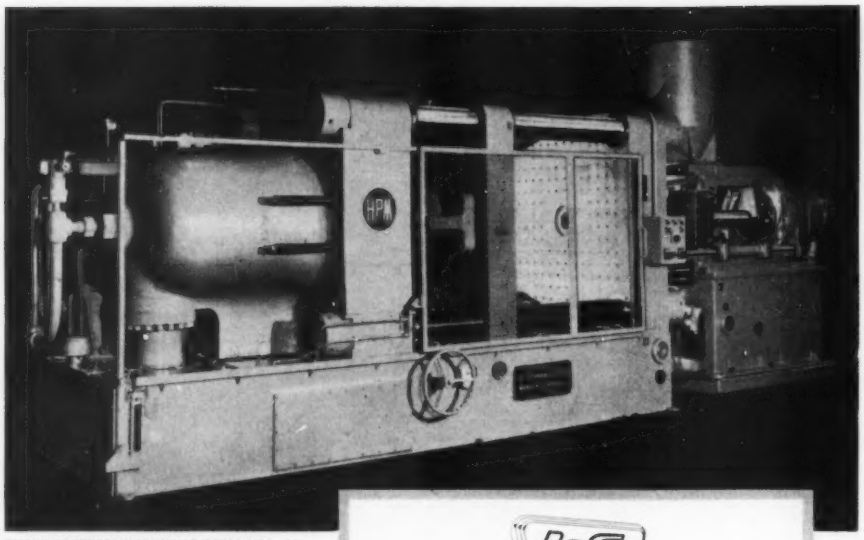

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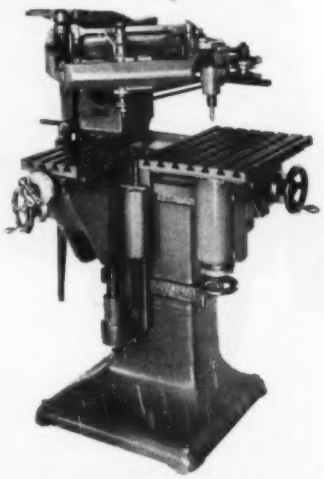

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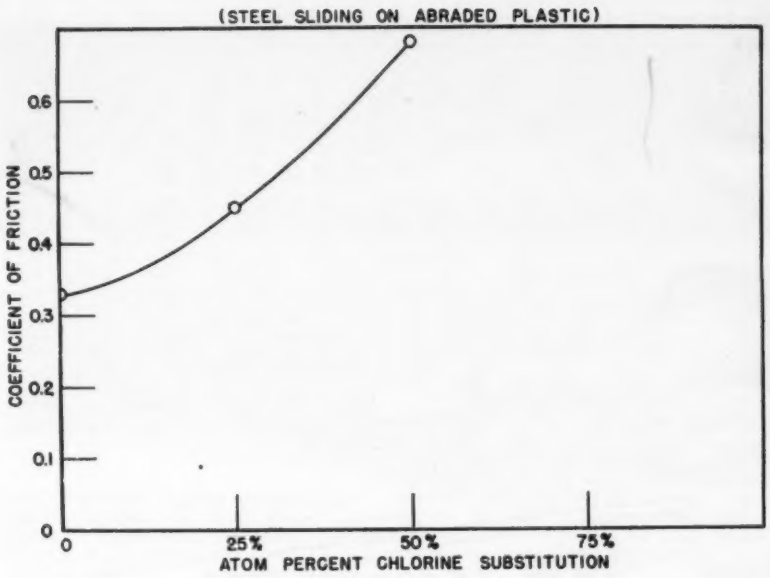


Fig. 12—Effect of chlorine substitution on static coefficient of friction of polyethylene

25% chlorine substitution in polytrifluorochloroethylene.

Polyethylene, polyvinyl chloride, and polyvinylidene chloride form a series containing 0, 25, and 50% of chlorine atoms substituted for the hydrogen atoms in polyethylene. Figure 12 is a graph of μ_s for steel sliding on the abraded plastic plotted against the percent of substituted chlorine atoms. Evidently, chlorine substitution increases μ_s rapidly; and there is no evidence of the curve approaching a horizontal asymptote even at 50% chlorine substitution. Replacing hydrogen atoms by chlorine appears to have caused the adhesional force to exceed the bulk shear strength of the plastic so that shearing in the bulk as well as "stick-slip" appeared even with 25% of substituted chlorine atoms; this was true whether that substitution was made in polyethylene to form polyvinyl chloride or in polytetrafluoroethylene to form T.F.C.E.

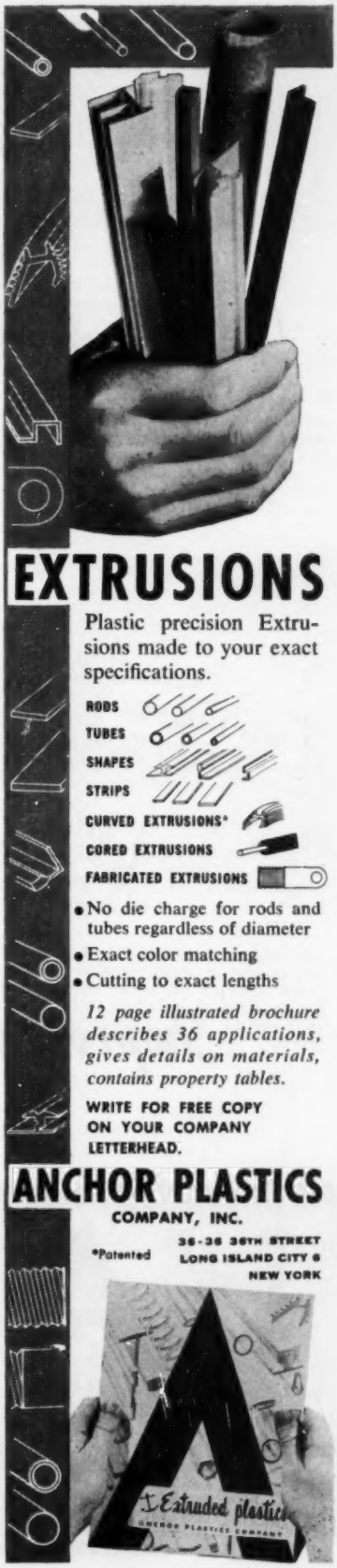
It is remarkable that one atom of chlorine per mole of monomer should have entirely nullified the good effect of three atoms of fluorine per monomer in T.F.C.E. Polished polyvinylidene chloride adheres so remarkably to other pieces of unplasticized material and to clean polished metals as to make it difficult to handle and to keep free of scars, scratches, and similar blemishes.

From these examples of the large rise in μ_s and μ_k caused by the addition of chlorine atoms to polyethylene or polytetrafluoroethylene, it is reasonable to predict a similar rise in the coefficient of friction resulting from the substitution of chlorine for hydrogen or fluorine in other types of polymers. The only proviso needed is that the resulting polymeric structure should permit some of the substituted chlorine atoms to be exposed at the plastic-air interface.

That steel sliding on abraded T.F.C.E. has a coefficient of friction (μ_s) which is four times greater than that of steel on T.F.E. may be surprising. Certainly, the coefficient of friction is one of the few physical properties which is very different for these two extremely stable plastics. It is also remarkable that μ_s for polyvinyl chloride ranges from 0.45 when abraded, to 0.9 when polished; whereas values for polyvinylidene chloride range from 0.7 to 1.8. These unplasticized materials might abrade badly when woven into fabrics. Plasticizers for such materials are needed to improve the boundary lubricating properties. Finally, the opposite effects of chlorine and fluorine substitution in polyethylene are strikingly shown by the change in μ_s of the polished material from 0.6 to 0.9 with the addition of one atom per monomer of chlorine and from 0.6 to 0.3 with the addition of one fluorine atom.

No evidence was found of shear

(*Continued on p. 220*)



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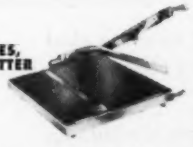

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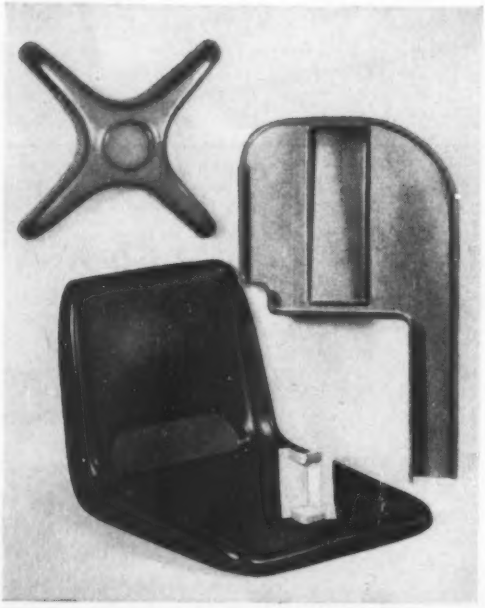

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orientation in the material transferred to steel rubbed with T.F.C.E., polyvinyl chloride, or polyvinylidene chloride. This does not prove that these polymers cannot be oriented by mechanical working, and there is much evidence in the literature that they can be so oriented (10); all that can be asserted is that the adhesion force per unit area between metal and plastic is sufficiently greater than the bulk shear strength of the plastic that insufficient slipping occurs at the metal-plastic interface to cause orientation.

Behavior of Thin Films

Such low coefficients of friction as 0.05 exhibited by thin films of polyethylene on hard substrates deserves explanation. The low friction is caused by the low bulk shear strength (s) of the organic coating and the low value of the real area of contact (a) resulting from the small deformation of the hard metal substrate. This is the same mechanism that Bowden and Tabor showed was responsible for the low coefficient of friction of a thin film of indium on steel (3—Chapter V). Since indium, polyethylene, and T.F.E. have values of s of 0.22, 0.91, and 1.62 it is not surprising that the μ_s and μ_k for films of the latter two on steel or brass should also be low.

Table V—Coefficients of Static Friction of Thin Coatings of Polymers on Steel

Polymer	(μ_s) *Steel ball sliding on coated steel* *Calculated*	*Measured*
TFE	0.01	0.04
Polyethylene	0.03 to 0.04	0.05
Polyvinyl chloride	0.24	0.30
TFCE	0.24	0.16
Polyvinylidene chloride	0.16	0.35

It is worthwhile to examine quantitatively the behavior of a thin, soft film of plastic material on a hard steel substrate, Equations 1 to 4 can be applied to the sliding of a hard steel ball on a thin film of bulk shear strength s_1 and mean yield pressure p_1 deposited on a hard substrate whose corresponding bulk constant s are s_2 and p_2. Now,

$W=p_1a_1$, $F_1=s_1'a_2$, and $F_1=\mu_1 W$, where F_1 is the frictional force and a_1 the real area of contact for the sliding of the steel ball on the bulk plastic. Also, we have

$W=p_2a_2$, $F_2=s_1a_2$, and $F_2=\mu_2 W$, where F_2 is the frictional force, a_2 is the real area of contact for the ball sliding on a thin film of plastic deposited on a steel plate, and s'_1 is the shear strength of the thin film of plastic under compression between the ball and steel plate. It therefore follows that,

$$\frac{\mu_2}{\mu_1} = \frac{s'_1}{s_1}\frac{a_2}{a_1} = \frac{s'_1}{s_1}\frac{p_1}{p_2} \quad \text{Eq. 5}$$

Equation 5 should be as correct (within a factor of two) as the Shooter and Tabor equations 1 to 4 on which it is based.

The ratio s_1'/s_1 in equation 5 can be considered equal to 1 for all practical purposes unless extremely large unit loads are used. Since $p_2 >> p_1$ for soft plastics on hard steel, then $a_2 << a_1$; hence, it follows from equation 2 that $\mu_2 << \mu_1$.

In Table V are presented the calculated and observed values of μ_s for a steel ball sliding on a thin plastic coating which has been applied to a hard steel plate.

The calculated value of μ_s was obtained by substituting in equation 5

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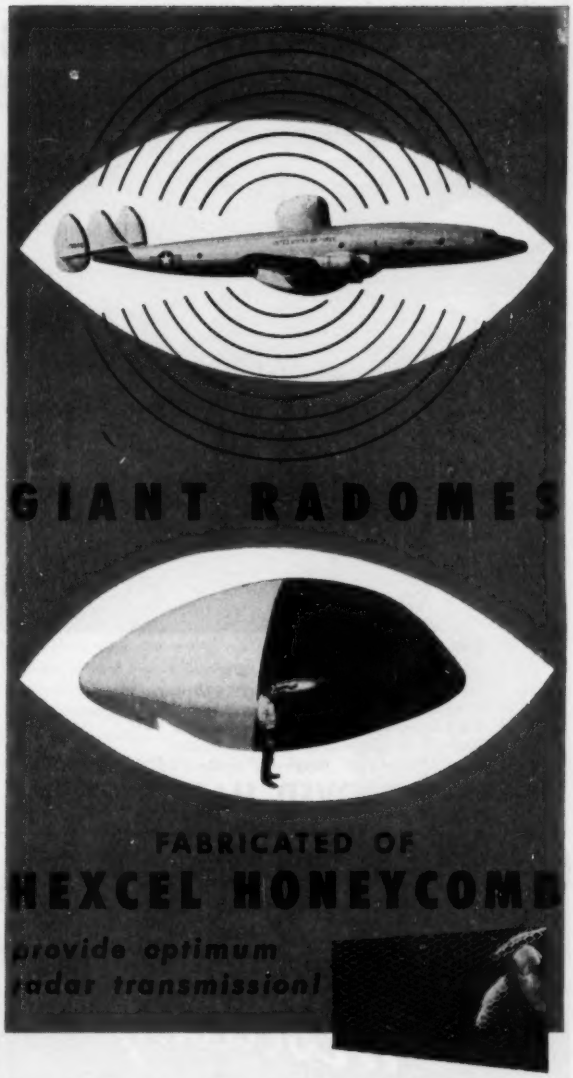

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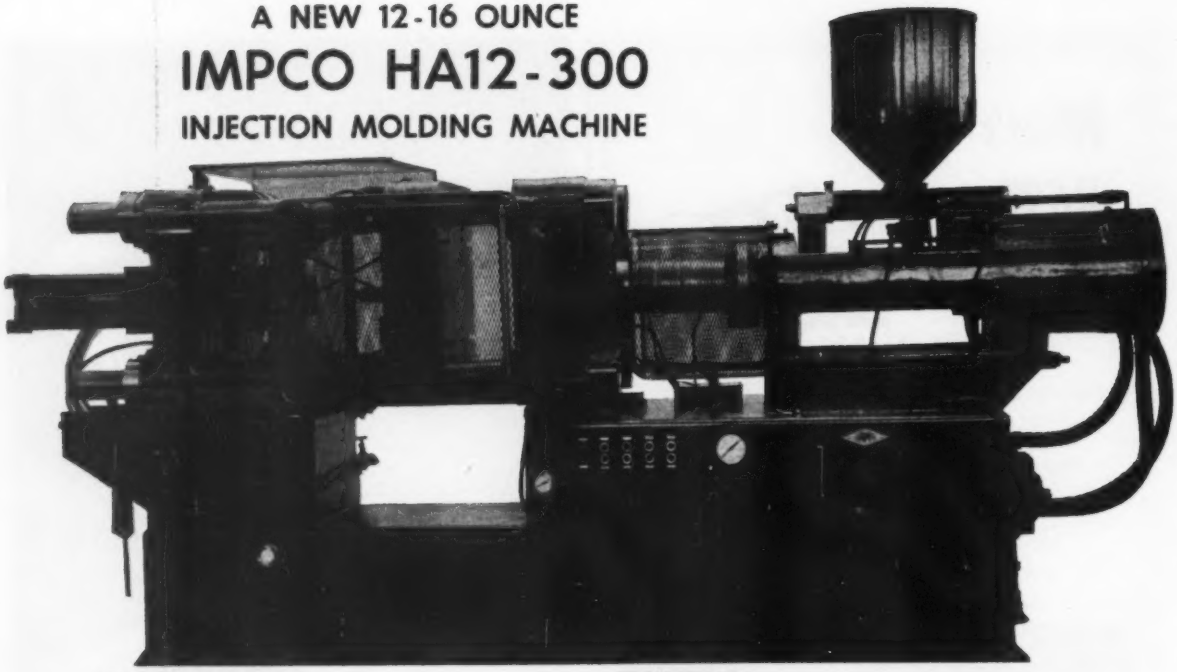

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the yield pressure of the steel plate, the yield pressure of the plastic, and the static coefficient of friction of the steel ball on the bulk plastic as given in column 5 of Table IV. The mean yield pressure of the steel plate used was 40,000 p.s.i. (29.1 kg./mm.^{2}). Except for T.F.E., the calculated static coefficients of friction are in reasonably good agreement with the observed values.

It is interesting to calculate μ_s for T.F.E. from equation 5 by using the theoretical value of $\mu_s = s/p = 0.42$ obtained from the fourth column of Table IV. The resulting calculated value of $\mu_s = 0.06$ is in good agreement with the observed value of 0.04 for a thin film on steel. We pointed out earlier that μ_s and μ_k had the same value of 0.04 for a film of T.F.E. on steel and indicated that this was due to the instantaneous transfer of T.F.E. on contact with the steel ball. As it seemed possible that this transfer property made it more desirable to use the kinetic rather than the static values of the coefficient of friction in equation 5, we have computed μ_k accordingly from the value of $\mu_k = 0.04$ of steel on bulk T.F.E. But the resulting kinetic coefficient of 0.004 is only one-tenth of the observed value. Therefore, it is concluded that the coefficient of friction can be computed reasonably accurately from equation 5 for each of the plastics studied except T.F.E. The low values calculated for T.F.E. are believed to be good evidence that considerable slipping at the interface between the T.F.E. film and the sliding steel ball occurs.

Thin Film as Dry Lubricant

In utilizing such thin films as dry lubricants, it is obviously important that they should not be readily ploughed through, scraped off, or peeled off the metallic slider so as to cause metal-to-metal contact. It is here that the transfer property of each of these plastics becomes especially valuable, because wherever a small hole develops in the film, the movement of the slider should tend to cover it with transferred polymer. In short, useful lubricating films will, under ordinary loads, tend to be self-maintaining or self-healing. This certainly will not be true of T.F.C.E., polyvinyl chloride, or polyvinylidene chloride. Hence, of the plastics materials studied thus far, this ease of material transfer combined with low shear strength is confined to poly-

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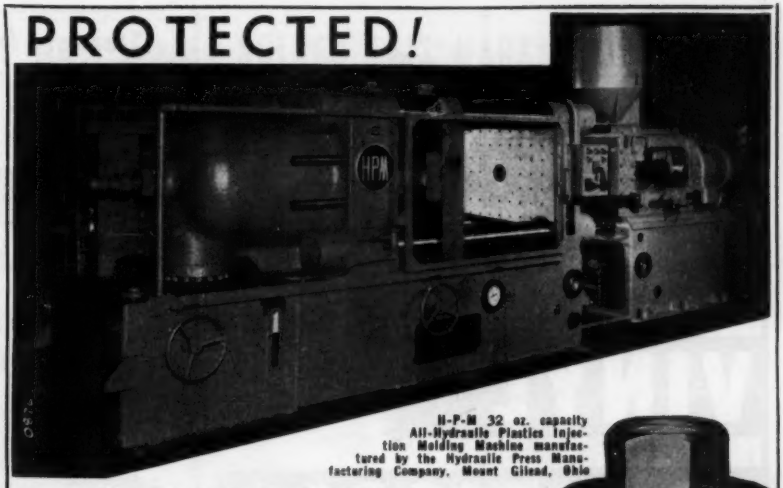

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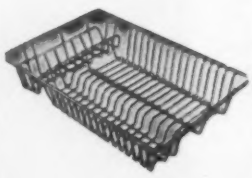

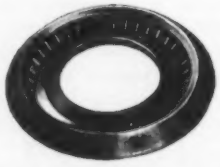

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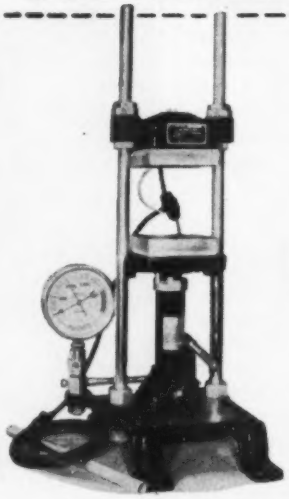

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Acknowledgements

This is a condensation of NRL Report 4167. The authors wish to express their appreciation to Mrs. Elaine G. Shafrin for her valuable electron diffraction studies and indebtedness to Mr. V. G. Fitzsimmons for the preparation of the T.F.E. films and to Mr. G. L. Gregg, Metallurgy Div., for conducting the shear-strength tests.

References

1. Shooter, K. V,. and Thomas, P. H., Research 2, 533-535 (1949).
2. Shooter, K. V., and Tabor, D., Proceedings, Phys. Soc. *B65*, 661-671 (1952).
3. Bowden, F. P., and Tabor, D., "The Friction and Lubrication of Solids," Oxford University Press, 1950.
4. Fox, H. W., and Zisman, W. A., J. Coll. Sci. 5, 514-531 (1950).
5. Fox, H. W., and Zisman, W. A., J. Coll. Sci. 7, 109-121 (1952).
6. Brubaker, M. M., U. S. Patent 2,393,967, February 5, 1946.
7. Joyce, R. M., and Sauer, J. C., United States Patent 2,479,367, August 16, 1949.
8. Sampson, J. B., Morgan, F., Reed, D. W., and Muskat, M., J. App. Phys. *14*, 689 (1943).
9. Bristow, J. R., Proc. Roy. Soc. *A189*, 88-102 (1947).
10. Fleck, H. R., "Plastics Scientific and Technological," London Temple Press (1951).—END.

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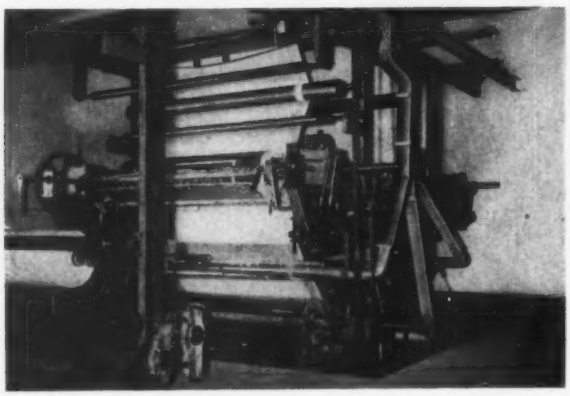

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Modified Resins

(Continued from p. 150)

uct. A reduction in the amount of resorcinol to 0.10 mol resulted in gelation of Portion G after 20 min. of reflux.

Acknowledgment

This investigation was sponsored by the Catalin Corporation of America whose support is gratefully acknowledged. The authors are also grateful to Dr. V. B. Fish for helpful suggestions. An application for a U.S. patent, covering the process and products of this study, has been made by the sponsoring company.

References

1. T. G. Harris, R. H. Horning, and H. A. Neville, Modern Plastics *31,* 136 ff. (Dec. 1953)

2. Swiss Pat. 236,594 (to De Trey Freres S. A.).

3. British Pat. 579,698 (to De Trey Freres S. A.): 666,299; 666,300 (to Ciba): 666,732 (to Bakelite).

4. U. S. Pat. 2,548,447 (to Shell): 2,558,949; 2,582,985; 2,592,560 (to Devoe & Raynolds).

5. U. S. Pat. 2,324,483 (Pierre Castan): 2,458,796 (to Ciba): 2,494,295; 2,510,885-6; 2,521,911; 2,528,359; 2,-528,360; 2,571,884; 2,585,115; 2,589,245; 2,591,539 (to Devoe & Raynolds): 2,594,979 (to General Electric): 2,602,785 (to Shell): 2,604,464 (to Canadian Industries).

6. J. McNabb and H. F. Payne, Ind. Eng. Chem. *44,* 2394 ff. (1952).

7. U. S. Pat. 2,564,194-5; 2,575,-440; 2,590,059; 2,595,619 (to Shell): 2,456,408; 2,493,486; 2,500,765; 2,502,-145; 2,511,913; 2,512,996; 2,542,664 to (Devoe & Raynolds).

8. T. F. Bradley Official Digest, Federation Paint & Varnish Production Clubs No. 281,452-63 (1948).

9. J. S. Long, J. Oil & Colour Chemists Assoc. *32,* No. 350 (1949).

10. Paint Oil & Chem. Rev. *113,* No. 23,15-18,48-9 (1950).

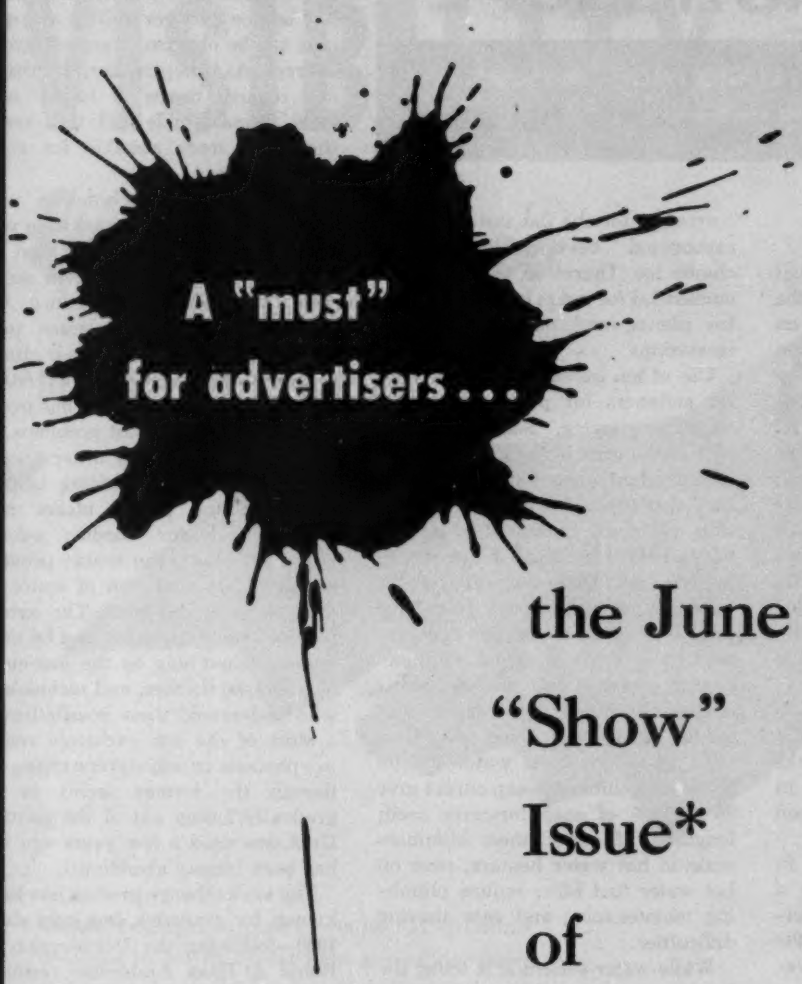
11. I. Silver and H. B. Atkinson, Jr., Modern Plastics *28,* No. 3, 113 ff. (1950).

12. K. S. Narracott, British Plastics *24,* 341-5 (1951).

13. T. R. Hopper, Amer. Ink Maker *29,* 10,61-3.113,115 (1951).

14. Vladmir Tupler, Chem. Prumyl 1 (26), 193-8 (1951).

15. E. Preiswerk, Plastics (London) *17,* 6-10,43-6 (1952). END



the June
"Show"
Issue*
of
MODERN
PLASTICS

* coinciding with the Sixth National Plastics Exposition to be held in Cleveland, Ohio, June 7-10.

THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Ion Exchange Resins

SELLING resin by the cubic foot is a rather unusual practice in the plastics industry, yet it is going on in steadily increasing amounts. Ion exchange resin is the commodity thus involved. Volume is believed to have been well under 10 million lb. annually until recently, but signs indicate that future consumption will soon be far in excess of that 10 million mark. Producers are secretive about actual volume produced, but they give a knowing albeit questioning nod of approval when a reporter asks if ion exchange resins may not eventually become one of the big volume plastics.

The largest installation today is probably the Los Angeles Metropolitan Water District waterworks where 50,000 cu. ft. of resin are in use and another 50,000 cu. ft. is soon to be added.

Ion exchange resins are used in the Los Angeles waterworks as a water softener. Many other municipalities are expected to adopt the same system now that its effectiveness has been proved over a long trial period.

Private industrial applications of ion exchangers for water softening have been well established for some time. A Philadelphia steam plant is now using many thousands of cubic feet of them to help prevent deposition of magnesium and calcium salts, prevalent in hard water, on side walls of boilers and pipe. Other large installations have been placed in parts of the country where salts found in hard water and other types of contamination are a problem.

Among institutions where ion exchange water softeners are helpful are laundries; hospitals; canneries; chemical, pigment, and textile mills; breweries; hotels; and ice plants.

Ion exchange resins also reduce the alkalinity in water which is responsible for some forms of metal corrosion; for the flat taste of many carbonated beverages; and for cloudy ice. Therefore, they are recommended for use in beverage plants, ice plants, and on railroads and steamships.

Use of ion exchange resins in water softeners for private homes is steadily growing. Something like 85% of the area in the United States is dependent upon hard water—the kind that leaves heavy rings in bath tubs and needs treatment by housewives before they use it for washing clothes. Domestic type water softening equipment costs from $200 to $300 a unit and intensive development of a major market for ion exchange resins in this proved field is under way. Some of the things that ion exchange resins can do when used to soften hard water in the home are: eliminate soap curds; save 30 to 60% of soap formerly used; lengthen life of clothes; eliminate scale in hot water heaters; save on hot water fuel bills; reduce plumbing maintenance; and ease shaving difficulties.

While water softening is today the largest consumer of ion exchangers, there are many other uses which have been proved successful. The resins can be used to remove metal contaminants such as iron from pickling baths; metallic residues from crushed fruit in syrup; calcium from milk, if desired; and also calcium from blood to prevent premature coagulation. Large amounts of iron have been removed from honey destined for candy production. Exchangers have also been used to recover copper, cobalt, nickel, gold, zinc, chromium, and other metals from various wastes and to prevent such wastes from polluting streams. It is probable that the use of ion exchangers for metal recovery and concentration, often combined with their use to prevent stream pollution, will some day become extremely large volume.

Other uses include recovery of chemicals and pharmaceuticals from wastes. For example, Vitamin B_2 can be adsorbed from a concentration as low as one part per million and quinine can be obtained from low grade sources. As a neutralizer, the resins can remove traces of formic acid from formaldehyde and thus make the latter more suitable for resin manufacture.

Sugar refining technicians now seem assured that ion exchange resins will soon be widely used to increase the yield of refined sugar from pulp and thus reduce the amount of surplus molasses produced. Several years ago their efforts to use ion exchangers seemed fruitless, but a new type resin has overcome most of their past problems.

There are still many other known and possible uses including helpful treatment for peptic ulcers and medical aid for cardiac edema (dropsy) where the resins prevent excessive accumulation of water in the tissues of the body. The extent to which these materials can be used seems limited only by the ingenuity of chemists, doctors, and technicians who understand their possiblities.

Most of the ion exchange resins are phenolic or polystyrene types, although the former seems to be gradually fading out of the picture. Urea was used a few years ago but has been largely abandoned.

The ion exchange process has been known for centuries, but only since 1940—following the introduction of Rohm & Haas Amberlite resinous exchangers—has the use of ion exchange become widespread.

Previous exchangers were natural and synthetic mineral-like products known as greensands and synthetic gel zeolites, but they were unable to withstand extreme conditions of temperature, aggressive chemical solutions, and long-term operations. There are now four or five producers of the resin type exchangers and each of them is becoming increasingly active as total volume begins to assume important poundage in the synthetics industry.

Silicone in Cosmetics

SILICONE fluids may be successfully blended with common cosmetic products, providing a sharp increase in water repellency and protective action against detergents.

This new range of possibilities for silicones was suggested by T. H.

*Reg. U. S. Pat. Off.

VISIBILITY

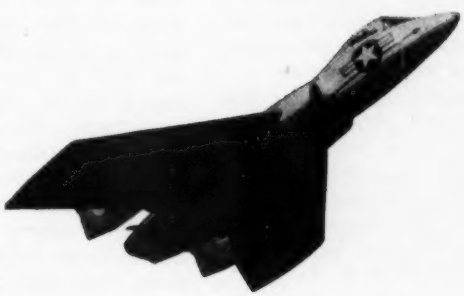
by Swedlow

in the F7U-3 Cutlass

CHANCE Vought Aircraft's twin-jet F7U-3 Cutlass, designed to out-fly or out-fight any carrier-based fighter in the world, is a larger, better-equipped, harder-hitting version of the original F7U-1 Cutlass, first sweptback-wing, tailless fighter to fly from a flat-top.

Vital factors in its maneuverability—at 650 mile-plus speeds—are the optical properties of its SWEDLOW transparent canopy and windshields.

Engineered and produced with a skill and experience outstanding in the aircraft industry, these fine Swedlow products, and four well-equipped plants behind them, are at the service of suppliers to the armed forces of the United States.



Swedlow PLASTICS CO.

LOS ANGELES, CALIFORNIA • YOUNGSTOWN, OHIO

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Reilly and E. G. Tajkowski of General Electric Co.'s Silicone Products Dept. in a joint talk before the scientific section of the Toilet Goods Assn. They said that potential applications included lipstick, hair dressings, cold creams, and hand creams, according to results of recent laboratory tests.

Low Weight Polyethylene

DESIGNED for production of low molecular weight polyethylene, a new petrochemical plant has been formally opened by the Semet-Solvay Petrochemical Div. of Allied Chemical & Dye Corp. at Tonawanda, N. Y. Annual production capacity is estimated at 20 million pounds.

Low molecular weight polyethylene is not used for the production of items generally associated with high molecular weight polyethylene, such as film, pipe, and molded products. The principal outlet so far has been in petroleum wax mixtures to coat paper that is used as a bread wrapper. Solvay's A-C polyethylene used in these formulations gives paper a clean, glossy appearance and greater scuff and blocking resistance. It is also suggested for use in emulsion-type household and automobile polishes, where its low cost, controllable quality, and freedom from wide price fluctuations give it advantages over imported vegetable waxes.

Other possible end uses for low molecular weight polyethylene are in the rubber, paint, container, textile, electrical insulation, printing ink, and leather finishing industries.

Semet-Solvay Petrochemical Div 's general sales offices are located at 40 Rector St.. New York, N. Y.

Automobile Bodies

THE first plant ever to be designed and constructed especially for the production of reinforced plastics automobile bodies is now in operation, with production schedules being steadily advanced as equipment and tools are "run in."

The plant, that of The Molded Fiber Glass Body Co., Ashtabula, Ohio, is equipped with 25 presses designed and built by Erie Engine & Mfg. Co., Erie, Pa., to specifications prepared by R. S. Morrison, president of The Molded Fiber Glass Body Co., and his engineers. The largest of these presses has a platen size 84 by 144 in., with 80 in. of daylight and a 50-in. stroke. Two other large presses are 96 by 96 in. in platen area and also have 80 in. of daylight and a 50-in. stroke. Others range down to small units for specialized component work. All are hydraulic.

In the preform department there are 10 units, all self-contained. Three of these are huge machines, one having 66-in. fans operated by 75-hp. motors. The size and power of these preformers may be assessed by comparing them with average units which use 26-in. fans operated by 20-hp. motors. These big preformers are equipped to do their own curing by the application of up to 2 million B.T.U. of instantaneous heat for 1 to 2 min., static pressure being maintained during this time. The smaller preformers feed into a traveling oven in which static pressure equal to that in the preformers is maintained.

The tooling job was so tremendous that 13 mold makers were involved. They are: Motor Patterns Co., Cleveland, Ohio; C. L. Gougler Machine Co., Kent, Ohio; Colonial Machine Co., Kent, Ohio; R. H. Freitag Mfg. Co., Akron, Ohio; Akron Standard Mold Co., Akron, Ohio; United Tool & Die, Inc., Salem, Ohio; Trumbull Pattern Works, Leavittsburg, Ohio; Shaw Industries, Inc., Franklin, Pa.; Anson Tools & Gages, Inc., Erie, Pa.; Richard Brothers Div. of Allied Products Corp., Detroit, Mich.; Ueber Tool & Die Co., Detroit, Mich.; Carl Zehr Co., Ashtabula, Ohio; and Lehto Machine Co., Ashtabula, Ohio. All molds are either high carbon steel plate or specially alloyed iron castings.

Bag molding of the initial distribution run on the Chevrolet "Corvette" was done by Lunn Laminates, Ohio, Inc., Ashtabula, Ohio, on plastics tools provided by licensees of Rezolin, Inc., Los Angeles, Calif.

A variety of polyester resins is used with fibrous glass reinforcement to obtain various physical qualities needed for the component automotive parts and to obtain different molding characteristics.

Princeton Fellowships

AN engineering curriculum of graduate study and fundamental research in plastics, leading to the degree of Master of Science in Engineering, is now offered by Princeton University, Princeton, N. J. The courses are particularly suitable for chemical, electrical, and mechanical engineers, as well as for chemists and physicists.

Instruction covers properties, evaluation, production, fabrication, design, application of materials, and chemistry of plastics. The program includes lecture and laboratory classes, and contact with industrial plants representing various phases of the plastics industry.

The university also announces that fellowships with stipends from $1500 to $2100, plus tuition, are available. Opportunities for employment as half-time research assistants at $1500 per academic year are also offered to students not on fellowships.

Applicants for admission must hold a Bachelor's degree in engineering or physical science from a recognized institution and must meet general admission requirements of the Graduate School of Princeton University.

Additional information may be obtained from Louis F. Rahm, director, Plastics Laboratory, 30 Charlton St., Princeton, N. J.

Anti-Adhesion

A RELEASE agent called Release-Cote has been developed for use in adhesive and coating applicating equipment by Release-Cote Products, 41 N. Moore St., New York, N. Y. The product prevents adhesives, lacquers, resins, paints, or other coating materials from adhering to the walls of pots, tanks, rollers, shafts, feed tables, and other exposed surfaces.

Tests indicate that Release-Cote will reduce clean-up time by at least 50% because it prevents build-up of adhesives on journals and side scrapers. When the adhesive dries, it can be easily peeled off; increased production and reduction of downtime are thus effected.

Before the machine is filled with adhesive, a film of Release-Cote is

PUT SELLING POWER
INTO YOUR PRODUCTS

TOUGH . . . TOUGH . . . TOUGHER . . .

Here's a graphic picture of flexing strength. In laboratory flexibility fatigue tests, Lustrex Hi-Test 88 styrene proves 2 to 3 times *more flexible* than other "impact" materials.

Dramatic flexibility test shows how you can step up quality with HI-TEST 88 LUSTREX Styrene Plastic

More and more, your customers – manufacturers, retailers, consumers – are putting their *buying* emphasis on "quality" products. And quality products *start* with quality materials.

Like Monsanto's Lustrex Hi-Test 88 styrene. Five times *tougher* than general purpose material, Hi-Test 88 has flexibility *more* than competitive with other "impact" materials. Better flexibility – greater toughness – you'll find, will be your *key* to higher quality, better selling products.

More, Lustrex Hi-Test 88 has good light stability, superior appearance and moldability. It has excellent vacuum forming and extruding characteristics. Because it orients less (and thus has less variation in internal stress in parts with adjacent thin and thick sections), it is highly recommended for applications where lacquering is done.

It will pay you to investigate Lustrex Hi-Test 88 styrene for *your* products, today! Mail the handy coupon for full information.

MONSANTO

SERVING INDUSTRY . . . WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division, Room 2602, Springfield 2, Mass.
Please send me full information on Lustrex Hi-Test 88 styrene.

Name & Title _____

Company _____

Address _____

City, Zone, State _____

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applied to all exposed surfaces (except applicator rollers) with brush, rag, sponge, or spray equipment. Coated areas can be quickly cleaned with a simple water rinse.

Application of a small amount of the product to the hands also prevents the adhesive from sticking to the skin.

Potdevin Machine Co., 285 North St., Teterboro, N. J., will distribute the product throughout the United States in quart, 1-gal., and 5-gal. drums.

New Vinyl Processor

A PLASTICS division has been organized by Seiberling Rubber Co., Akron 9, Ohio. This is the first major product diversification entered into by the company since World War II, according to J. P. Seiberling, president.

Initially, the company will concentrate on the production and fabrication of rigid vinyl sheet. Pilot plant work on this project has been going on for over two years and a comparatively small quantity of this material has been sold in various forms for over a year. It is a type of rigid vinyl sheeting used for chemical tanks, ducts, advertising signs, and decorative windows and awnings.

Seiberling's plastics division will occupy a new plant at Newcomerstown, Ohio, about 60 miles south of Akron, and is expected to be in full-scale operation by mid-summer of 1954.

Polyethylene Supplier

ESTABLISHMENT of a new product sales group for polyethylene resins has been announced by Monsanto Chemical Co.'s Plastics Div., Springfield, Mass. R. C. Evans, general manager of sales, states that the company's first polyethylene production unit will be in operation by the fourth quarter of 1954, producing approximately 66 million lb. annually.

Edmund S. Childs, who spearheaded Monsanto's product development work on polyethylene, has been named sales manager of the unit. He joined the Plastics Div. in 1940 and in 1941 was transferred to the division's New York office as sales representative for Vuepak, Monsanto's cellulose acetate rigid transparent packaging material. In 1948, he was promoted to assistant manager of product development.

Plasticizer Prices

PRICE reductions of 2¢ per lb. for Cabflex DDP (di-decyl phthalate) and 3¢ per lb. for Cabflex DDA (di-decyl adipate), in tank car or tank truck quantities, have been announced by the Plastics Chemicals Div. of Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. Cabflex DDP now sells for 36¢ per lb. and Cabflex DDA for 46¢ per pound.

Cabflex DDP and Cabflex DDA are all-decyl plasticizers which combine low volatility, low temperature performance, and high permanence in vinyl compounds.

Polyethylene Bags

AN indication of how polyethylene bags are being used to gain customer good will is given by Militzer's, a bakery chain in Milwaukee, Wis., which twice weekly is giving away polyethylene showbags with its rye bread.

The showbags, made by Central States Paper & Bag Co., St. Louis, Mo., are printed in a bright yellow. Instructions recommend that the housewife keep the bread in her showbag to preserve its freshness.

It is believed that the use of polyethylene film for sales aids such as this will increase the use of polyethylene film manifold, since it is now being usually used at the retail counter simply as a container or package covering without much thought given to the many novel ways in which the versatile material can be used to attract the customer's attention.

Pipe-Sealing Compound

CHEMICALLY inert, a new pipe thread sealing compound with a base of pure Du Pont Teflon has been announced by Eco Engineering Co., 12 New York Ave., Newark, N. J. Designated as T-Film, the compound is claimed to be suitable for metallic- and plastic-threaded connections in all types of process pipe lines and apparatus. It forms a continuous film which prevents spiral wicking, leakage, and contamination of material being conveyed.

Because of Teflon's non-adhesive characteristics, T-Film leakproof joints can be easily broken when necessary, eliminating galling and sheared threads.

The compound is available in two consistencies—light bodied for precision threads and viscous for manual application—and may be obtained in 2-oz. jars and 8-oz. cans at $1.00 per ounce. Eco states that 2 oz. will seal between 30 and 40 joints in 1-in. pipe.

Ink for Plastics

INTRODUCTION of a new stamp pad ink for plastics has been announced by Artone Color Corp., 17-21 W. 3rd St., New York 12, N. Y. The ink can be applied with an ordinary rubber stamp from any new stamp pad to such plastics as acrylics and cellulose acetates. It can also be used to stamp rubber, Neoprene, leather, and wood.

High-Impact Styrene

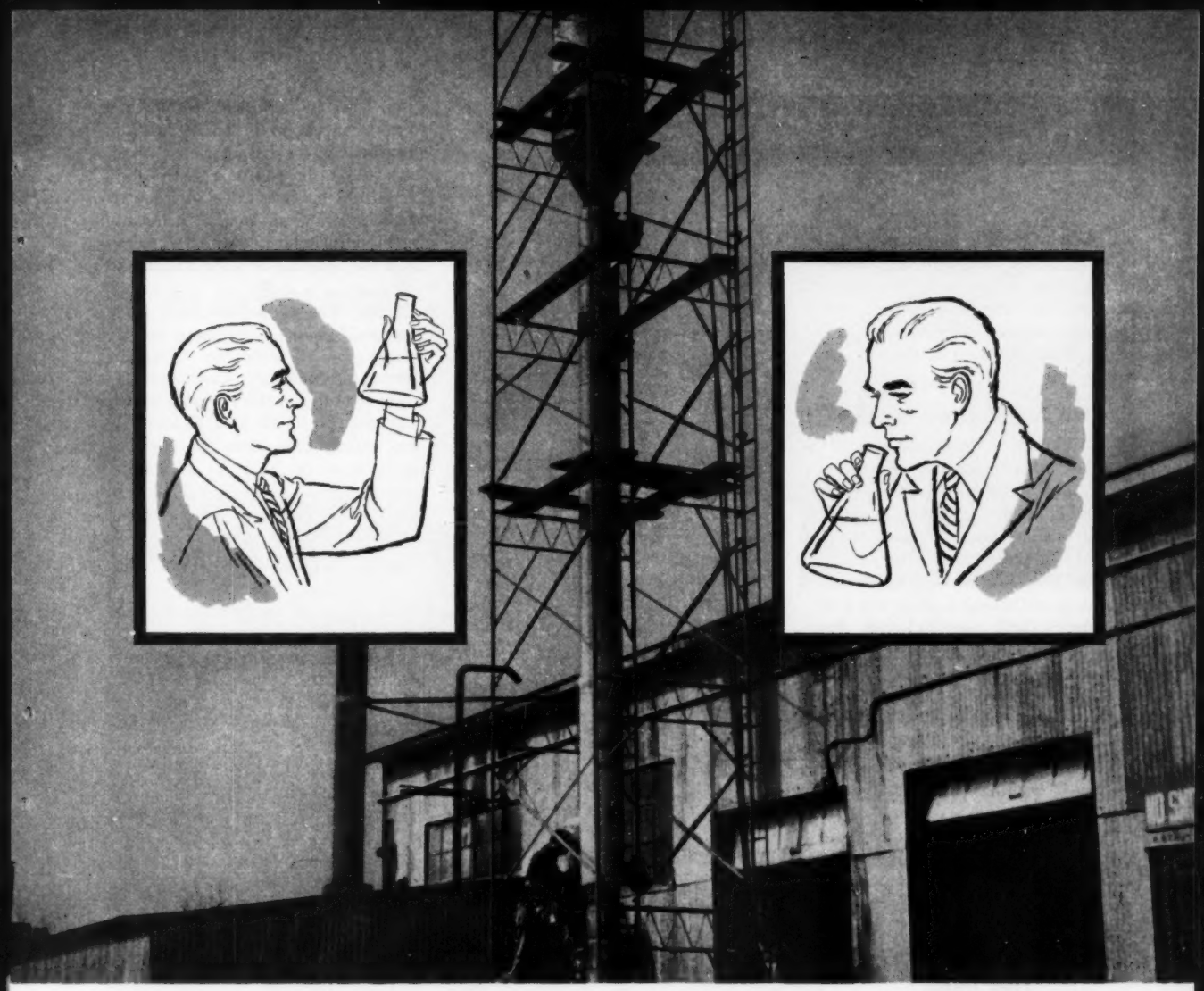
DEVELOPMENT of a new granulation of Styron 475 for customers who color their own molding compounds has been announced by The Dow Chemical Co., Midland, Mich. The size and shape of the new granules are designed to improve color blending at a new level of efficiency in the molding plant.

Dow also announces a price reduction of 3¢ per lb. on all available granulations of Styron 475 in natural color, including the new granulation. The price drop to 34¢ per lb. on any quantity is effective immediately.

Vinyltoluene

A PLANT for the manufacture of vinyltoluene has been completed and is now in full production, according to an announcement from The Dow Chemical Co., Midland, Mich.

The new monomer, similar to styrene in chemical behavior and following the same price schedule as Dow styrene, is expected to contribute improved products in the fields of synthetic rubber, paint vehicles, rubber reinforcing resins, and polyester resins. At present, the foremost



You can rely on Witco PLASTICIZERS

Characteristic of WITCO esters are their clarity, absence of color, and lack of odor. These physical properties in a plasticizer are important in many applications where the plastic end product is produced to meet special requirements.

Complete technical service is available to every user of these WITCO esters. Write today for technical data and/or samples of the esters in which you are interested.

Among the ester-plasticizers manufactured by WITCO are the following:

Butyl Oleate—technical and premium grades
Butyl Stearate—technical and cosmetic grades
Dibutyl Phthalate • **Dioctyl Phthalate**

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use of vinytoluene is in the paint industry, where it has made possible the development of many new paints and finishes. The raw material reacts to form clear, useful paint vehicles with all commercially important drying oils.

Coated Fabric Firms Combine

PURCHASE of the equipment and inventory of Blackburn Products, Inc., Newark, N. J., producers of simulated leathers and plastics-coated fabrics, has been announced by The Columbia Mills, Inc., Syracuse, N. Y. The plant will operate as a division of Columbia Mills and I. R. Blackburn will remain with the Newark company.

E. F. O'Reilly, president of Columbia Mills, states that the acquisition of the Blackburn production facilities rounds out the Columbia line of industrial fabrics and that the company is planning expanded activity in this field.

Columbia Mills has been engaged in the coated fabrics business for over 60 years and has mills operating in Minetto, N. Y.; Saginaw, Mich., Los Angeles, Calif.; and Wilkes-Barre, Pa.

Film Dome

A TRANSPARENT dome for a new hotel at Woods Hole on Cape Cod, Mass., made from Mylar polyester film, is being planned by E. Gunnar Peterson, architect of the hotel. The dome will be 53 ft. across at the base, 28 ft. high, and will rest on a lacy gridwork of wooden strips.

The dome will afford diners a clear view of the harbor and the sky.

Sprayed Metal Molds

JOB contracts for the manufacture of sprayed metal molds are now being accepted by Metalmold Forming Co., 53 Greene St., New York 13, N. Y. The company has developed a process for the production of low-cost metal molds for use in vacuum forming, slush molding, and low-pressure laminating.

Master models made of wood, plastics, glass, plaster of paris, and even wax, can be used. Detail of design in the resulting mold cavity depends only upon the finish of the master model. No chasing or touch-up work is required on the finished mold.

The company claims that the process is satisfactory for single- as well as multiple-cavity molds. Dimensional stability can be held to a tolerance of ± 0.020 inch. Cooling or heating coils can be built into the mold.

Peroxide Plant Rebuilt

RESUMPTION of peroxide production and start of regular deliveries was announced by the Lucidol Div. of Novadel-Agene Corp., 1740 Military Rd., Buffalo, N. Y.

As a result of an accident, production facilities for liquid peroxides were recently destroyed at the division's plant. Damage to other equipment also made it necessary to temporarily halt production of some of the solid and paste compounds.

Immediately following the accident, steps were taken to provide additional production facilities at another location. Three individual operating units for the production of liquid peroxides are being set up. The units have been designed in such a way that they will be interchangeable and will in effect afford the Lucidol Div. three separate plants for the manufacture of its products.

In addition to the construction program, arrangements have been made for the immediate production of t-butyl hydroperoxide, t-butyl perbenzoate, and di-t-butyl peroxide.

Casein

NOW available from Harwick Standard Chemical Co., 2595 E. State St., Trenton 9, N. J., is a line of casein, including high quality domestic and Argentine. The domestic casein is available in meshes from 30 to 80; Argentine casein can be supplied unground or in domestic grind.

EXPANSION

Shawinigan Resins Corp., Springfield 2, Mass., is expanding production facilities for polyvinyl butyral for the second time in less than a year. The new facilities are expected to be in operation by April 1954. The program will boost capacity about 20% and is in addition to the 35% increase which was effected recently. Polyvinyl butyral is used primarily for the interlayer in laminated safety glass for automobile windshields and windows.

R. K. Mueller, president of Shawinigan Resins, a company jointly owned by Shawinigan Products Corp. and Monsanto Chemical Co., states that this is the company's fifth expansion in its 10-year history. He also reports that while the new capacity may be held on a standby basis at times, it will be available to fill the cyclical peak needs of the automobile industry.

Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y., has started construction on its new Norco, La., plant for the production of allyl chloride and chlorohydrins. Its output will be used to increase Shell's glycerin production by 25 million lb. per year and to make available substantial additional quantities of epichlorohydrin and Epon resins. This is the first step in the company's current glycerin expansion program.

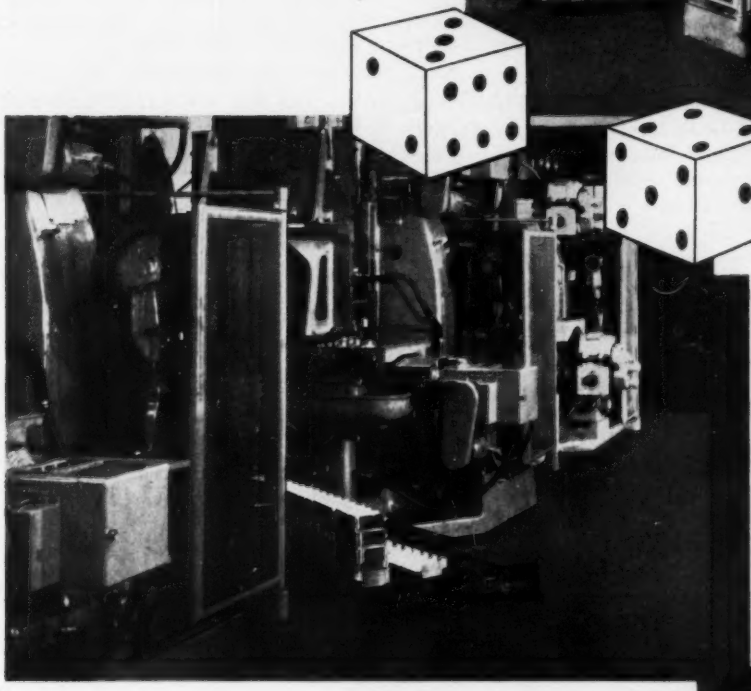
Completion of the plant is expected late in 1954.

Pittsburgh Plate Glass Co., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa., has purchased a four-story factory building and seven acres of land adjoining its Fiber Glass manufacturing plant at Shelbyville, Ind. The building, formerly owned by Porter Carpet Sweeper Co., occupies approximately 75,000 sq. ft. of floor space. The company will utilize the building for warehousing and shipping purposes.

Pittsburgh Plate Glass started production of superfine and yarn fibers at the Indiana location last year. Manufacturing operations have constantly expanded since then and personnel has increased to a current total of 475 employees.

National Vulcanized Fibre Co., Wilmington, Del., announces plans for expansion of its manufacturing facilities and product development. The company states that part of the plan involves organization of a new development and research department devoted to improvement of company products, solving of chemical problems, and development of

a natural...



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from your master patterns

Clark-Aiken makes available to you the most complete facilities for production of precision duplicate molds to be found anywhere, including:

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1 Single-Spindle Keller, 4 ft. x 2 ft. capacity, 3-Dimensional
1 Single-Spindle Keller Profiler, 24 in. x 16 in. capacity
2 Single-Spindle Kellers, 36 in. x 20 in. cap., 3-Dimensional
2 3-Spindle Kellers, 36 in. x 10 in. center distance, 3-Dimen.

7 NEW AC-TYPE ELECTRICALLY-CONTROLLED CONTOUR MILLING MACHINES manned by master craftsmen working three shifts, insure prompt delivery of precision duplicate molds in any quantity from master patterns of any material.

Send prints or sample parts for prompt quotations and delivery dates

PRECISION MOLD DIVISION

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new materials for use in end-product manufacturing.

The new program also includes a half-million dollar building and facilities expansion project at the company's Phenolite plant in Kennett Square, Pa. In addition, studies of fiber and paper manufacturing processes at the company's Yorklyn and Newark, Del., plants are being made for the purpose of formulating plans for improvements.

Vulcanized Fiber also announces the appointment of **H. H. Street** as plant manager of the Yorklyn plant.

Linzmeyer Development Laboratories, Inc., has moved into its new plant at Long Beach Blvd. and State St., Long Beach, N. Y., occupying an area of 10,000 sq. feet. Facilities are now available for design and development of fibrous glass reinforced plastics structures, as well as for prototypes, tooling, small-volume production, and testing facilities.

Duraglass Boat Co., an associated company, will shortly start volume production of small boats.

Polymer Industries, Inc., will open a new plant early this year on a four-acre site in Springdale, a suburb of Stamford, Conn. The move will consolidate the company's Astoria and Brooklyn, N. Y., operations and will enable Polymer to immediately increase present production 50 percent.

In addition to its new plant, the company will continue to produce a full line of adhesive and textile chemicals and finishes at its plant in Greenville, S. C.

Premier Thermo-Plastics Co., announces that, as part of its expansion program, a new plant has been established in Jeffersontown, Ky., a suburb of Louisville, occupying 16,000 sq. ft. of space on eight acres of land. Premier also reports that it has doubled its capacity for the production of vinyl molding and extrusion compounds and other thermoplastics.

Gordon Chemical Co., "A" and Lombard Sts., Wilmington, Del., reports that additional plant facilities recently completed now permit a substantial increase in the production capacity of Uramol urea molding compounds. **A. J. Gordon**, president, states that the new equipment promises to increase production 35 percent.

Sales representatives for Gordon are **L. P. Mendoza**, Flatiron Bldg., New York 10, N. Y., and **William Dunnican**, 352 Plymouth Rd., Union, N. J.

Hellmich Mfg. Co., 6024 Lloyd Ave., St. Louis 10, Mo., producers of Color-Flyte Melmac dinnerware, has opened a second plant in Puerto Rico. The new factory is a half-million dollar development located on a three-acre tract in Baynamon, an industrial suburb near San Juan. The reason for the move into Puerto Rico, according to company officials, is to place the source of supply closer to the South American markets and to aid in easing the domestic demand.

Current sales volume, about 390% over 1952, has resulted in a 24-hr., seven-day week schedule. Plans are to keep both plants in operation at full capacity.

East Coast Aeronautics, Inc., subsidiary of Barium Steel Corp., has expanded its reinforced plastics facilities, with offices and manufacturing operations in a 24,000-sq. ft. plant in Mt. Vernon, N. Y. The company is engaged in the design and manufacture of reinforced plastics aircraft components, rockets, tanks, containers, shelters, and pipe. Complete facilities have been established for the production of plastics patterns and plastics dies for molding reinforced plastics and forming metal parts.

East Coast Aeronautics also announces the following appointments: **P. R. Young** has been named chief project engineer; **Kurt Hertz**, manufacturing superintendent; **H. E. Ennis**, contracts manager; and **Dr. Walter Brenner**, chief chemist.

COMPANY NOTES

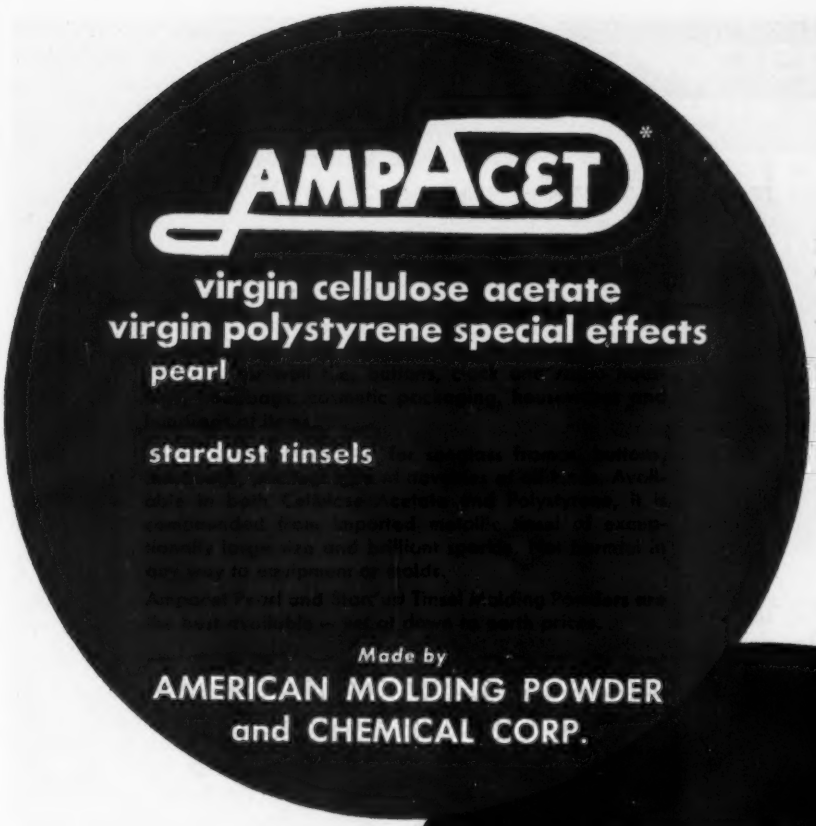
Barrett Div., Allied Chemical & Dye Corp., has named **Hans W. Wanders** as sales representative in Chicago for the Plastics and Resins Dept. Mr. Wanders formerly served in the **Plaskon** offices in Toledo, Ohio, before completing two years of naval service which included a year as assistant for fibrous glass and plastics to the chief of the Navy Dept.'s Bureau of Ships.

Fielden Instrument Div., Robertshaw-Fulton Controls Co., 2920 N. Fourth St., Philadelphia 33, Pa., announces the appointment of **Lee E. Cuckler** as manager of the Engineering Dept. and **Frederick L. Maltby** as technical director of the division. Mr. Cuckler was formerly with the Brown Instrument Div., **Minneapolis-Honeywell Regulator Co.**, and Mr. Maltby, with Bristol Co. and Rudolph Wurlitzer Co.

Koppers Co., Inc., Chemical Div., Pittsburgh 19, Pa., announces that **William J. Gort** and **Roger Macdonald**, formerly with the Product Development Section, have been appointed development coordinators of the division. Their new duties will include guiding laboratory and pilot plant development work at the various plants of the division and preparing technical programs to be carried out by plant personnel.

Donald J. Hanchett and **Dr. Edwin W. Shand** have been assigned to new posts in the Sales Development Section. Mr. Hanchett, who has been adhesives product manager of the division's Sales Dept. since 1951, is now manager of the thermosetting resins branch of the Section. In addition to retaining his former responsibilities for merchandising and marketing of Penacolite low-temperature setting resorcinol formaldehyde adhesives, Mr. Hanchett will supervise sales development of resorcinol for tire cord adhesives and of chemicals used in tanning, waterproofing, and finishing leather. Dr. Shand, who has been a technical representative of the Sales Dept. since 1948, has been named manager of the Specialty Chemicals Branch of the Sales Development Section.

The Goodyear Tire & Rubber Co., Akron 16, Ohio, announces that **John V. Brown** has been promoted to sales representative in the company's Chicago office. He will specialize in the sale of chemical products to the plastics and rubber industries, providing technical service to molders who use Goodyear's new plastic, Plio-Tuf. **Charles S. Pyne** has been added to the Midwest territory, with



if
you
work
with
plastics
you
should
work
with
us...

PLASTICS SCRAP

and
virgin plastics materials

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Want to sell plastics scrap? *We need it!*

Want to buy reprocessed plastics materials? *We guarantee quality.*

Want your materials reprocessed? Compounded? Colored? *We are equipped to serve your needs.*

- *CELLULOSE ACETATE*
- *BUTYRATE*
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- *METHYL METHACRYLATE*
- *VINYL*
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headquarters in Minneapolis, Minn., and will service the paper, paint, and coating industries in Minnesota and Wisconsin. **James M. Jones** has been assigned to the South Atlantic sales territory and will operate from the Philadelphia, Pa., office. He will provide technical service on Plio-Tuf resins and Chemigum rubbers.

20th Century Plastics Co., 2845 W. Irving Park Rd., Chicago 18, Ill., has named **L. A. Shea** and **J. H. De Sobe** of **L. A. Shea & Associates** as its midwestern sales representatives. They will handle all decorative injection molding sales for 20th Century from the company's offices.

Bolta Products Sales, Inc., Lawrence, Mass., has appointed **Sumner L. Trilling** general manager of the Hotel and Restaurant Equipment Div. He will supervise the development and sale of Bolta's food service equipment, including plastics trays. Mr. Trilling, former sales manager of the division, succeeds his father, the late Leo M. Trilling.

Hooker Electrochemical Co., 14 Union St., Niagara Falls, N. Y., announces the following appointments: **Dr. Samuel J. Nelson** and **John E. Wier**, chemists, have been added to the resins and plastics group of the Research and Development Dept. Dr. Nelson had been previously engaged in the preparation and application of polymers at **U. S. Rubber Co.** Mr. Wier had been in the U. S. Army for five years and subsequently became a general physical scientist in the Organic Plastics Section of the National Bureau of Standards, Washington, D. C. **Joseph E. Thornberg** has been made technical sales service field representative and **Delmont J. Boundy** and **Henry R. Morrison** have been promoted to the sales-production coordination office of the Sales Dept.

Krieger Color & Chemical Co., Inc., 6531 Santa Monica Blvd., Los Angeles 38, Calif., has named **Wells-White Co.**, 6625 Delmar Blvd., St. Louis 5, Mo., as its distributor for the Missouri, Kansas, and southern Illinois territories. **Marvin Holland Co.**, 4237 Indiana Ave., Chicago 15, Ill., will distribute Krieger's line in the Chicago and northern Illinois area.

Anderson Bros. Mfg. Co., Rockford, Ill., announces that **Swan F. Anderson**, president since 1916, has been appointed chairman of the board. He is succeeded as president by **Ralph F. Anderson**, former secretary-treasurer, who also retains his position as treasurer. Other officers appointed are **Walt Gunnerson** as vice president in charge of sales; **V. J. Spencer** as vice president; and **George Boone** as secretary.

C. A. Litzler Co., consulting engineers and designers of equipment and systems for the continuous processing of webs and monofilaments, has been recently established at 11621 Detroit Ave., Cleveland 2, Ohio. The new company will specialize in the design, manufacturing supervision, and erection of calender train units and similar continuous processing materials handling systems.

C. A. Litzler, president of the new firm, recently resigned as president of **Industrial Ovens, Inc.**, which he founded 12 years ago.

The Pantasote Co., 26 Jefferson St., Passaic, N. J., has increased its sales staff in the heavy gage and lightweight gage divisions. **Fred Elmer** has been named sales representative of the heavy gage division and will cover New England and New York; **James A. Fiesel** will cover the territory from New York to Washington. **Max Blutman, Stanley Wolff**, and **Murray Weiss** will service the New England, New York, and Washington areas for the lightweight gage division.

F. S. Stewart Associates, 10819 Venice Blvd., Los Angeles 34, Calif., is a new organization specializing in chemical research and engineering services in the field of plastics and related organic materials.

Cadillac Plastic Co., 15111 Second Ave., Detroit 3, Mich., announces the following appointments: **George Grayson**, formerly with **Du Pont** for 18 years, has joined the engineering group at the new Detroit Cadco plant; **John Logan** is now in charge of sales for Cadco cast acrylic rods and tubes at the Ohio district office; **Philip Hoekstra** is now chief engineer of fabrication in the Thermoplastics Div.; and **Howard Rose** is in charge of sales in Illinois.

The Sierracin Corp., Burbank, Calif., manufacturers of Sierracin 611, a transparent thermosetting plastic sheet material for use in airplane canopies, announces the following changes: **Ramsey C. Armstrong**, formerly president of Welex Jet Services, Inc., Ft. Worth, Texas, has been named president and chairman of the board. **Elvin M. Bright**, developer of Sierracin 611, has resigned as president of the company to establish an independent development company, **Bright Laboratories**, 7238 Atoll St., N. Hollywood, Calif. Mr. Bright will continue to do development work for Sierracin.

Industrial Radiant Heat Corp., Gladstone, N. J., has appointed three new representatives as follows: **Robert S. Hudgins, Jr.**, Box 6091, Charlotte 7, N. C.; **J. R. Fuller Co.**, 7033 Kelly St., Pittsburgh 8, Pa.; and **John P. Clark Co.**, 124 S. Easton Rd., Glenside, Pa.

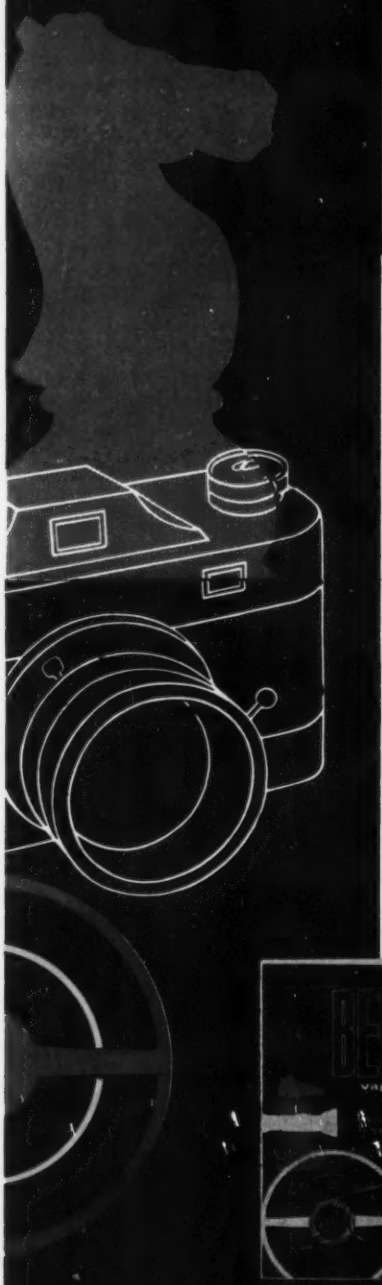
Prolon Plastics Div., Prophylactic Brush Co., Florence, Mass., has named **Martin & Wilson**, 200 Fifth Avenue, New York, N. Y., as manufacturers' representative to handle its two Melmac dinnerware lines, Prolon Ware and Florence by Prolon.

Rubber and Plastic Color Div., Sinclair & Valentine Co., has moved its plant to 75 Front St., Ridgway, Pa. The division has appointed **Harwick Standard Chemical Co.**, Akron, Ohio, as its sales agent. **Theodore G. Sullivan**, head of Harwick, has also moved to the Ridgway plant.

International Rubber & Plastics Co., a new division of **Lefton Iron & Metal Co.**, has entered the scrap plastics and rubber field. The new plant and warehouse facilities are located at 521-23 Spruce St. and the general offices at 212 Victor St., St. Louis, Mo. **Gerald Aul** has been appointed sales manager.

Continental Can Co., Inc., 100 E. 42nd St., New York 17, N. Y., has appointed **John C. Jennings** product sales manager of plastics bottles which are manufactured by the newly-acquired **Elmer E. Mills Corp.**

vacuum metallizing efficiency increased by vaporite* stranded tungsten filament



Higher evaporating capacity— longer life—less breakage

Stranded tungsten filaments were originated and introduced by Bergen Wire Rope Co. in 1948. They received immediate recognition throughout industry as an important advance in vacuum metallizing technique. Wide experience since that date with all types of metals and products has enabled Bergen engineers to develop stranded tungsten filaments to the highest efficiency.

Vaporite stranded tungsten filaments are 99.95% pure, chemically clean and exceptionally ductile. They are available in a wide range of cross-section and wetting areas for use with a variety of metals and operating conditions.

OUTSTANDING ADVANTAGES

Maximum surface area to cross-section ratio
High evaporating capacity • Uniform flow of metal
Rapid evaporating rate • Longer life-minimum breakage

SHIPPED — *Long lengths on reels*
Cut lengths for single coils and finished coils

Send today for literature

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WIRE ROPE COMPANY
21 GREGG STREET, LODI, NEW JERSEY

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subsidiary. Mr. Jennings joined the company in 1946 as Atlanta district sales manager of the Paper Container Div. He will make his headquarters with Elmer E. Mills in Chicago, Ill.

Acheson Colloids Co., Port Huron, Mich., announces that **Bart C. Dickey** has been appointed process development engineer to improve and develop processing operation for its products. **Frank M. Hunter** has been named service engineer for Michigan, with offices at 3000 E. Grand Blvd., Detroit 2, Mich.

Olin Industries, Inc., East Alton, Ill., announces the appointment of **N. H. Collisson** and **M. F. Meissner** as vice presidents of operations to assist **F. S. Elfred**, executive vice president. Mr. Collisson, who has been general manager of the company's Cellophane Div., will adminster the Film, Paper, Forest Products, and Electrical Divs. Mr. Collisson is the former U. S. Coal Mines Administrator and special assistant to the Secretary of the Interior.

Milton L. Herzog has been named general manager of the Film Div. at Pisgah Forest, N. C., which was formerly known as the Cellophane Div. He is the former production manager and assistant to the general manager of the Cellophane Div. The Film Div. develops, manufactures, and sells cellophane, polyethylene, and other films.

American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y., has organized two new divisions—Research Div. and Organic Chemicals Div. **Kenneth H. Klipstein** has been named general manager of the Research Div., which will be responsible for the operation of the Stamford Research Laboratories of the company under the direction of **Dr. J. T. Thurston.**

L. C. Duncan is general manager of the Organic Chemicals Div. and **V. E. Atkins**, assistant general manager. This division will merge and consolidate the activities of the Petrochemicals Div. with those of the Calco Chemical Div.

American Cyanamid has also organized three new departments—Fiber Development Dept., Market Research Dept., and New Product Development Dept. **C. W. Bendigo, Borden R. Putnam, Jr.,** and **Dr. Nolan B. Sommer** have been appointed managers of the respective departments.

Hercules Powder Co., Inc., Wilmington, Del., has made the following appointments: **J. O. Small** has been named assistant director of sales of the Synthetics Dept.; **J. G. Little**, who has been manager of the department's Chicago sales district, is now sales manager in charge of products for paint, varnish, lacquer, floor coverings, food, drugs, and cosmetics; **G. E. Osburn** has been appointed sales manager in charge of products for adhesives, printing ink, textiles, plastics, and the petroleum industry; and **R. M. Miller** has been named technical sales-service supervisor.

Everlite Plastics Mfg. Co. has recently been established at Houston, Texas, where it will manufacture both extruded and injection molded plastics products. **John Sheesley** is president of the new company and **W. N. Wilkerson**, vice president.

Everlite Plastics is an affiliate of **Bettis Corp.** and **Production Tooling Co.**, Houston.

One of the principal products of the new company is Everlite polyethylene pipe.

Monsanto Chemical Co.'s Plastics Div., Springfield, Mass., has promoted **E. H. French, Alfred E. Pigeon, Arthur J. Raiche,** and **Wilbur M. Swan** to sales representatives. Mr. French will handle Ultron vinyl film from the division's New York sales office; Mr. Pigeon will service similar accounts from Springfield; Mr. Raiche and Mr. Swan will be transferred to the Chicago sales office, where Mr. Raiche will handle the sale of Lustrex styrene and Mr. Swan, the sale of sheets, Vuepak cellulose acetate, and Ultron vinyl film.

U. S. Fiber & Plastics Corp.'s Sports Plastics Div., 200 Fifth Ave., New York, N. Y., has named **George Gowen** of **Thomas F. Gowen & Sons**, P. O. Box 231, Drexel Hill, Pa., as its Northeastern sales representative. Mr. Gowen will handle the division's Million-Air sports line which includes plastics chest waders, camping mats, wader tops, and a variety of other fishing and camping items.

Consolidated Vacuum Corp., 735 Ridge Rd. W., Rochester 3, N. Y., subsidiary of **Consolidated Engineering Corp.**, Pasadena 8, Calif., has elected **J. Kneeland Nunan** president. Mr. Nunan, who was named executive vice president early in 1953, succeeds **Philip S. Fogg** as president. Mr. Fogg will continue as chairman of the board.

Spun Lite Corp., 3788 N. W. 52nd St., Miami, Fla., Div. of **Waterbury Companies, Inc.**, Waterbury 20, Conn., has opened general sales offices at 17 E. 42nd St., New York 17, N. Y. **George E. Baer, Sr.** will head the office and supervise all sales activities. **Paul Hoffman** is general manager of Spun Lite in Miami; **Jordan J. Pfuntner,** head of chemical research and development; and **Robert Swett,** factory superintendent in charge of production of Spun Lite materials.

The company also announces the appointment of the following representatives to handle Spun Lite materials: **Robert Lewis, The Leward Co.**, 9 S. Clinton St., Chicago 6, Ill.; **Martin Hutt, Sales,** 136 Front St., Berea, Ohio; **Herbert A. Rust, Rust Associates,** 1004 Westside Dr., Greensboro, N. C.; and **C. A. Allen, Almar Agencies,** 1074 Commercial Trust Bldg., 15th & Market Sts., Philadelphia 2, Pa.

Bakelite Co., 260 Madison Ave., New York 16, N. Y., has appointed **R. A. Richards** as manager of its Bonding Materials Div. Mr. Richards succeeds **E. H. Gross** who was recently appointed to the Market Development Dept. Mr. Richards joined Bakelite in 1945 as a technical representative for the Molding and Extrusion Materials Div. in the Detroit, Mich., office.

B. F. Goodrich Chemical Co., Rose Bldg., Cleveland Ohio, has named **Anton Vittone, Jr.** plant manager of the company's Avon Lake, Ohio, experimental station. He replaces **Harry B. Warner** who was recently appointed vice president of BFG Chemical Co. Mr. Vittone comes to

Vol. 1 No. 8

Advance Info

Published by ADVANCE SOLVENTS & CHEMICAL CORP.

One of a Series on Production Aids — Clip and Save for Reference

SUPERIOR ADHESION PROPERTIES GAIN WIDE ACCEPTANCE FOR ADVANCE SPECIALTY RESINS

Exhibiting excellent compatibility and strong adhesive properties, two Advance thermoplastic resins have gained wide and increasing acceptance for use with various types of film formers. These qualities have made them especially popular in the ink, plastics and rubber industries.

These two Advance resins are Advaresin CXF and Advaresin KF. Advaresin CXF has an exceptionally light color, is brilliantly clear and transparent; Advaresin KF is light straw color, brilliant and transparent. Both Advaresin CXF and KF have good color retention at elevated temperatures.

The wide compatibility range of these Advaresins includes vinyl copolymers, vinyl chloride polymers, nitrocellulose and cellulose ethers (but with slightly limited compatibility with cellulose acetate), shellac, zein, natural rubber, chlorinated rubber, nitrile rubber, neoprene, ureas, melamines, saran and styrene. They are both soluble in phthalate and most other plasticizers.

The most important feature of these resins is their ability to impart increased adhesive properties when compounded with other materials. As examples: the adhesion of rubber to rayon is increased; in plastics, adhesion of vinyl coatings to metals, fabrics and wood is greatly improved; incorporated in rotogravure printing inks, the adhesion of the printing on vinyl sheets is strengthened; used in conjunction with aniline printing inks, the adhesion of the printing on cellophane and styrene sheets is intensified. Furthermore, a much better gloss is imparted to such printing inks because of these resins' rub-resistant properties. An added advantage of these resins for aniline inks is their excellent dilution stability. This assures freedom from throw-out on continued dilution.

Formulators of gasoline-resistant finishes, rubber cements of neoprene and nitrile rubber bases, have found Advaresins CXF and KF excellent for their purpose.

Samples and further data will be gladly sent on request.

EASIER, ECONOMICAL CURING OF POLYESTER REINFORCED PLASTICS WITH ADVANCE COBALT PROMOTERS

Progressive simplification in the curing of polyester resins has resulted in tremendous advances in their application and use. Polyester glass fiber reinforced plastics are now being manufactured in large quantities without the labor and the need for expensive metal molds. Inexpensive moldings of almost any size are possible through the use of new curing methods which employ catalytic promoters with the conventional peroxide catalysts.

Faster and quicker cures are being accomplished by the addition of small quantities of ADVANCE COBALT PROMOTERS at the proper stage of these new curing processes. The operational benefits to be derived from the use of ADVANCE COBALT PROMOTERS are primarily, among others, as follows:

(a) Acceleration of room temperature curing.
(b) Shortening of gelling time, making faster production schedules possible.
(c) Virtual elimination or substantial reduction of surface tack on surfaces exposed to air during curing.

Curing at room temperatures is of great importance to the laminating and casting industries, as it enables them to pre-cure their items at room temperature, remove the pre-cured objects from the mold, and after-cure outside the mold. Thus they secure a much faster production schedule, and the physical properties of the cured resin are somewhat improved.

ADVANCE COBALT PROMOTERS, of which there are four types, are more fully described in literature available upon request.

ADVANCE SOLVENTS & CHEMICAL CORP. 245 Fifth Avenue, New York 16, N.Y.

Stabilizers
Catalysts, Promoters
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Vistac
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Avon Lake from the Institute, W. Va., where he was plant manager. The Institute plant, operated for the Government by BFG Chemical, is currently being put in standby condition by the company.

PERSONAL

Herman R. Thies has been promoted to the newly-created position of general manager of all chemical products of **The Goodyear Tire & Rubber Co.**, Akron, Ohio. **E. J. Thomas**, president, states that this key assignment grew out of the expanding volume of chemical business, and was made to better coordinate all activities of supplying chemical raw materials to such fast-growing industries as plastics, paint, textile, paper, and rubber.

Mr. Thies joined Goodyear in 1930 as a rubber research compounder. He was appointed assistant director of research in 1936 and six years later was advanced to manager of Pliolite sales. In 1945 he became head of the plastics and coating department and subsequently manager of Goodyear's chemical division when it was organized in 1948.

Robert M. Moore has been elected vice president in charge of sales of **Pittsburgh Coke & Chemical Co.**, Pittsburgh 19, Pa. Mr. Moore joined the company in 1942 and has been general manager of sales for the past seven years.

Kenneth Y. Ryan has been named general sales manager of **M & N Hydraulic Press Co.**, Clifton, N. J. He was formerly connected with **Brown Instrument Div., Minneapolis-Honeywell Regulator Co.**

Norman L. Cooperman is now technical service manager of the vinyl department of **Nuodex Products Co., Inc.**, Elizabeth, N. J. Mr. Cooperman was formerly head of the rubber and plastics department of Thompson-Weiman Co., Montclair, N. J.

Adelbert H. Loux has been named general sales manager of **Flexible Tubing Corp.**, Guilford, Conn.

Gale M. Deam is now secretary-treasurer of **Resin Industries**, Santa Barbara, Calif. His former affiliations were with Mission Metalcrafters and Johns-Manville.

Dr. Alfred J. Stamm of **U. S. Forest Products Laboratory**, Madison, Wis., has been elected chairman of the **American Chemical Society's Div. of Cellulose Chemistry** for 1954. Dr. Stamm succeeds **Dr. Kyle Ward, Jr.**, head of the cellulose group at the **Institute of Paper Chemistry**, Appleton, Wis.

J. J. Clemens is now Eastern sales manager of **Sandee Mfg. Co.'s Industrial Products Div.**, with offices at 13 Carrelton Dr., Paterson, N. J. Mr. Clemens will handle the sales and promotion of the company's full line of extruded styrene copolymer sheets, as well as custom extruded shapes.

E. Willard Winslow has been appointed manager of the advertising and sales promotion and marketing section of **General Electric Co.'s Silicone Products Dept.** at Waterford, N. Y.

Philip J. Coverdale has joined **Regal Plastic Co.**, 2800 E. 14th St., Kansas City 27, Mo., as sales manager. Mr. Coverdale was formerly associated with Woodall Industries, Detroit, Mich., and Marketing Associates, Chicago, Ill. He will retain his office in Milwaukee, Wis.

Regal Plastics is expanding its operations and is now installing complete equipment for the production of reinforced fibrous glass moldings.

Earl C. Lenz, formerly vice president and general sales manager of **Paisley Products, Inc.**, subsidiary of **Morningstar, Nicol, Inc.**, has been elected vice president of sales and advertising of the parent company and all its subsidiaries. Mr. Lenz, who has been with the Paisley division for 21 years, will headquarter at the executive offices, 630 W. 51st St., New York 19, N. Y. Morningstar, Nicol operates three Paisley industrial adhesive plants in New York, Chicago, and St. Louis.

MEETINGS

Jan. 25-28—Plant Maintenance and Engineering Conference and Show, International Amphitheatre, Chicago, Ill.

Jan. 31-Feb. 3—Western Merchandise Exhibitors Assn., Western China, Glass, Gift, Jewelry, Toy, Stationery, and Housewares Show, Civic Auditorium, Palace, St. Francis, and Sir Francis Drake Hotels, San Francisco, Calif.

Feb. 3-5—The Society of the Plastics Industry, Reinforced Plastics Division, Ninth Annual Technical and Management Conference, Edgewater Beach Hotel, Chicago, Ill.

Feb. 8-12—Western Winter Market Show, Western Merchandise Mart, San Francisco, Calif.

Feb. 14-17—Western Merchandise Exhibitors Assn., Pacific Northwest China, Glass, Gift, Stationery, Jewelry, Toy, and Housewares Show, Civic Auditorium, Seattle, Wash.

April 3-4—Packaging Machinery Manufacturers Institute, Spring Meeting, Hotel Dennis, Atlantic City, N. J.

April 5-8—American Management Association, Twenty-third National Packaging Exposition and Conference, Convention Hall, Atlantic City, N. J.

April 14-16—Society for Experimental Stress Analysis, Spring Meeting, Educational Lecture and Exhibit, Netherlands Plaza Hotel, Cincinnati, Ohio.

April 26-30—American Society of Tool Engineers, Tenth Biennial Industrial Exposition, Convention Center, Philadelphia, Pa.

April 27—Association of Consulting Chemists and Chemical Engineers, Inc., Symposium and Banquet, Hotel Belmont Plaza, New York, N. Y.

S.P.E. Meeting

Jan. 26-28—Tenth S.P.E. Annual Technical Conference, Royal York Hotel, Toronto, Canada.

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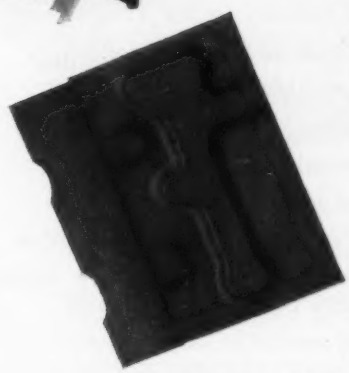
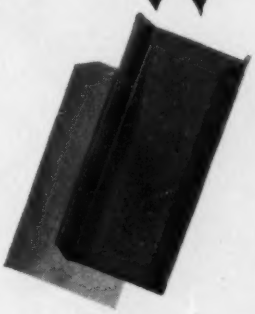
New DILECTO CF-1





- *Non-After-Glow characteristic*
- *A canvas-based laminate*
- *Post-Forms to shapes in inexpensive cold molds*
- *Excellent mechanical strength*
- *Resists abrasion, has long life*
- *Easily machined and punched*

Where can you use this new canvas-based C-D-F "Post-Forming" Dilecto grade CF-1? Presently it's used for a multitude of aircraft and semi-structural parts . . . as ribbed panels, fan blades and ammunition bay liners, guards and cover frames . . . as ventilating ducts, battery box containers . . . switch covers, thermostat mounting plates, etc. CF-1 has a tremendous potential in electrical as well as other industries because of its strength and light weight.

"Post-Forming" Dilecto CF-1 is easy to work with. Heated until pliable with infra-red, electric ovens, strip heaters or hot plates, or immersed in molten alloys or hot oil, it is then quickly placed in a cold mold and pressed or formed until cold enough to retain the desired shape. Inexpensive molds can be made from hard wood, cast or laminated plastics, steel and metal alloys. Normally C-D-F supplies Dilecto CF-1 in sheets from 1/32" to 1/4" thicknesses.

C-D-F's sales engineers (offices in principal cities) will cooperate with your designers and production experts. C-D-F also forms and fabricates Dilecto to your specifications. Write for technical bulletins describing Dilecto CF-1 as well as other grades of Post-Forming Dilecto.

NON-AFTER-GLOW — Post-Forming Dilecto CF-1 incorporates special chemicals in the varnish that produce no apparent after-glow once an ignited specimen has been extinguished. This product complies with the SAE-Aeronautical Material Specification AMS-3605, latest revision.

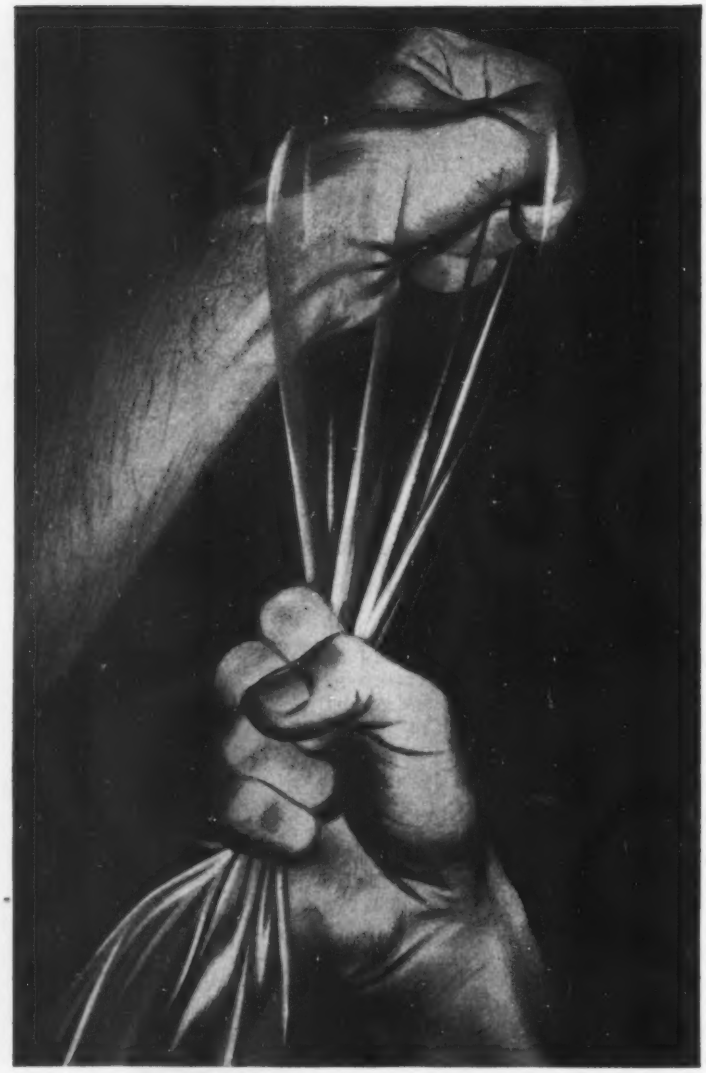
SILICONES, TOO — C-D-F offers other post-forming grades of laminated Dilecto: Grade GB-SF is a glass-base Silicone laminate furnished in a semi-cured state for forming pieces where high heat resistance and low dielectric losses are required. Can be formed into armature slot insulators, rectangular coil forms, primary-secondary cylindrical or rectangular insulators for dry type transformers, etc. Grade XF Dilecto is a paper-base grade for mechanical applications where electrical properties are secondary.

THE NAME TO REMEMBER CDF FOR POST-FORMING DILECTO LAMINATED PLASTICS

Continental-Diamond Fibre Company

NEWARK 28, DELAWARE

about Benzoflex Plasticizers



STRONGER! Curing temperature with Benzoflex plasticizers can be lower, or greater strength can be obtained at usual curing temperatures.

Cures at lower temperatures... Cuts processing time

Check these advantages of TENNESSEE'S new plasticizers... Benzoflex 9-88 and 2-45 for your vinyl formulations:

1. Equal physical properties of finished products at lower curing temperatures.
2. Shorter processing time.
3. High refractive index.
4. Improved tensiles at usual curing temperature.
5. High solvency for vinyl resins.
6. Plastisols do not swell with age.
7. Low volatility from film.
8. Compatible with other plasticizers.
9. Reasonable cost.
10. Good odor.
11. Low migration to synthetic finishes.
12. Satisfactory low temperature characteristics for most applications.
13. Good color.
14. Low order of toxicity indicated.
15. Easily stabilized.

Mail the coupon today for complete information on Benzoflex 9-88 and 2-45.

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Send complete information on new Benzoflex Plasticizers.

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TENNESSEE PRODUCTS & CHEMICAL *Corporation*
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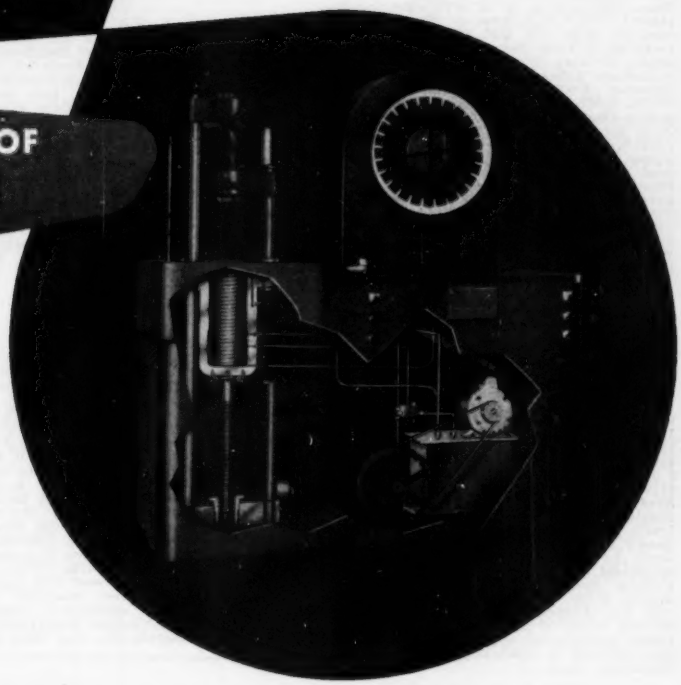
Producers of: FUELS • METALLURGICAL PRODUCTS • TENSULATE BUILDING PRODUCTS • AROMATIC CHEMICALS • WOOD CHEMICALS • AGRICULTURAL CHEMICALS

NEW, COMPACT SINGLE UNIT UNIVERSAL TESTING MACHINE

- Built as a single unit so that floor load is distributed over large area.
- Overall dimensions less than two unit machine (only 67½" wide by 27" deep).
- More compact machine (indicator only 77⅛" high and loading cage 73¼" high).

WITH ADVANTAGES OF TWO-UNIT DESIGN



- Gage panel is supported separately by a framework which extends to the floor, preventing the shock of breaking specimens from being transmitted to the load indicator.
- Therefore, recoil is not transmitted to the indicator and cannot jar the maximum hands out of position.
- Friction of the maximum hands can be adjusted to the maximum necessary for accurate indication.

This low-cost Baldwin 60-H universal testing machine of 60,000 lb. capacity has many other advantageous features. For complete technical information please write for Bulletin 4204 to Dept. 2126, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

TESTING HEADQUARTERS

BALDWIN-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. • Offices in Principal Cities

In Canada: Peacock Bros., Ltd., Montreal, Quebec

CLASSIFIED ADVERTISEMENTS

MODERN PLASTICS reserves the right to accept, reject or censor classified copy.

EMPLOYMENT • BUSINESS OPPORTUNITIES • EQUIPMENT (used or resale only)

MACHINERY and EQUIPMENT FOR SALE

HYDRAULIC PRESSES: 1—Erie Belt Press, 4242 Tons, 2—8" openings, 18'—9"x52" Steel Steam Platens, 6 rams—30" dia.x16" stroke. 1—Birdsboro, 2000 Tons, down-acting ram 34" dia.x14" stroke, 48" DLO, 42"x42" bed area. 1—Clearing, 500/1500 Tons, completely self-contained with controls for manual or automatic operation, suitable for compression and injection molding. 1—Farrell, 393 Tons, 48"x48" steam platens, 2—15" openings, 4 rams—10" dia.x24" stroke, approx. 15" per opening. 1—Watson-Stillman, 100 Tons, down-acting ram 11½"x9½"x6" stroke, 22"x20" bed, 24" DLO, self-contained, 15 HP MD Vickers Pump. Unit PRACTICALLY NEW. 1—Watson-Stillman, 100 Tons, 11¾"x12" platens, 22½ DLO, ram—8" dia.x15" stroke, complete with 3 HP MD Pump. 1—HPM, 100 Tons, 18"x18" Platen Area, ram—8" dia.x18" stroke, 30" DLO, Steel Cylinder—4000 PSI. 2—Burroughs, 75 Tons, down-acting, 17½"x17" electric-heated platens, 13½" DLO, ram—8" dia.x10" stroke, complete with 7½ HP MD Oilgear Pump. 1—HPM, 35 Tons, down-acting ram 6" dia.x6" stroke, 15" DLO, 12"x6" bed area, self-contained. 1—Industo Laboratory Press, 12 Tons, Hand Operated, 8"x8" electrically heated platens. NEW. 3—Denison, 4 Tons, Model FH4-Col. down-acting ram—3¼"x2"x12" stroke, 18" DLO, bed 22"x14", 8½" throat, complete with 3 HP MD Pump, time delay control, all valves, piping, gauges, controls. 1 machine slightly used, 2 units still in original crates. Also: Plastics & Rubber Extruders, Mills, Mixers, Grinders, Injection Molding Machines, Pumps, Valves, Platens, etc. JOHNSON MACHINERY COMPANY, 683 Frelinghuysen Avenue, Newark 5, New Jersey. Tel.: Bigelow 8-2500. What have you for sale? What are you looking for?

FOR SALE: 60 ounce Jackson & Church, used one week, reasonable. 48 ounce Lester, 1950. 32 ounce Watson-Stillman, new. 32 ounce Reed-Prentice, new 1950. 28 ounce Watson-Stillman, 1948, $26,000. 24 ounce DeMattia. 22 ounce Impco vertical. 22 ounce Reed-Prentice, new 1948. 20 ounce Lester. 16 ounce Reed-Prentice, new 1946. 16 ounce H.P.M., 1946, $15,000. 12 ounce Lester. 12 ounce Reed-Prentice, new 1950, will accept terms. 12 ounce H.P.M., 1942, $6000. 12 ounce Watson-Stillman, new 1953. 9 ounce H.P.M., 1946. 8 ounce DeMattia, 1946, $7500. 8 ounce Leominster, 1945, $5500. 8 ounce Reed-Prentice, 1951. 8 ounce Reed-Prentice, double link, $6000. 6 ounce Watson-Stillman, $3000. 6 ounce Lester, Model 1½L. 4 ounce Reed-Prentice, new 1945. 4 ounce Lester. 4 ounce Lewis, 1953, $5750. 4 ounce DeMattia, horizontal, $1500. 3 ounce Fellows, new. 2 ounce Fellows, 1951. 2 ounce DeMattia, vert. hydraulic, $1000. Compression presses, 50 ton to 2000 ton, all types; G.E. Dielectric Preheater; vacuum plater 4' cap.; used scrap grinders, ovens; tumbling dry mixers, new, $315. ACME MACHINERY & MFG. CO., 102 Grove Street, Worcester, Mass.

FOR SALE: 1—24 oz. DeMattia. 1—16 oz. Reed Prentice. 1—16 oz. H.P.M. 3—12 oz. Watson-Stillman. 4—12 oz. Lesters. 1—9 oz. H.P.M. 3—8 oz. Reed-Prentice. 1—8 oz. Watson-Stillman. 1—4 oz. Watson-Stillman (Vertical). 1—3 oz. McGray. 1—2 oz. Watson-Stillman (Vertical). 1—1 oz. Van Dorn. Preform, Compression, Extruding, etc. Machines. Machine Tools for making Plastic Molds. PETERSON PRODUCTS, INC., 1854 Baldwin St., Waterbury, Conn. Tel.: 5-2252.

FOR SALE: Injection Presses: 24 oz., 12 oz., 8 oz. Reeds. 4 oz., 9 oz., 16 oz. HPM. 1 oz. Van Dorn. 3¼ oz. Moslo vertical. Extruder: 1½" NRM. Scrapgrinders. Ovens. Laboratory Presses. Various Compression Presses. Pumps. 1—Stokes automatic 50 tons 235 A. 42" Slitting & Rewind. machine. Complete Wire Coating & Drying Unit. 3 HP Gasboilers. List your equipment with me. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: Rubber and Plastic Equipment. Farrell 16" x 48", 15" x 36" and 6" x 12", 2 roll rubber mills. Other sizes up to 84". New Seco 6" x 12" and 6" x 16" Lab. Mixing Mills and Calenders. Rubber & Plastic Extruders. Stokes #280, 4" diam. Preform Machine. 350 ton Hydr. Press 22" x 24" Platens. New Loomis 340 ton, 24" x 56" platens. Southwark 325 ton, 42" x 24" platens. Adamson 200 ton, 24" x 24" platens. 200 ton Brunswick 21" x 21" Platens, 14" Ram, Record Presses. W.S. 150 ton 30" x 60". 100 ton 24" x 24". Elmes 75 ton 30" x 36". Also presses Lab. to 2000 tons from 12" x 12" to 48" x 48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump. 250# W.P. W.S. 4 Pigr. High and Low Pressure Hydr. Pump. HPM 5 GPM 2700 lbs. Elmes Hor. 4 Pigr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & Single Punch Preform Tablet Machines ½" to 4". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers 100, 50, and 9 gal. Plastic Grinders. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107-8th Street, Brooklyn 15, N.Y. STerling 8-1944.

FOR SALE: 1—F.B. 24"x84" Mill, w.c. bearings, red. drive, 240 HP a.c. motor; 1—F.B. 32"x92" inverted-L 4 Roll Calender, red drive, d.c. vari-speed motor; 1—Royle No. 4 Extruder, M.D.; 1—F.B. 6"x13" self-contained 3 Roll Calender M.D.; 1—6"x12" Lab. Roller Mill; 1—Reed-Prentice 4 oz. Model 10A Injection Molding Machine; 1—No. 1 Banbery Mixer; 7—Dry Mixing Blenders up to 5,000 lbs.; 3—Micro Pulverizers; 2—Ball & Jewell Cutters; 1—Kux Model 50 Preform Machine; 1—Day Re-Ball No. 71 S/S sifter. Also Grinders, Extruders, Pulverizers, Baker Perkins Mixers, Screens, Kettles, etc. Send us your inquiries. We buy your idle machinery. CONSOLIDATED PRODUCTS CO., INC., Observer Highway, Cor. Bloomfield Street, Hoboken, N. J. HOboken 3-4425. N. Y. Tel. BArclay 7-0600.

FOR SALE AT GREAT SAVINGS
Colton 2RP and 3RP Rotary and 4T Tablet Machines. Day 40x120 Single Deck Sifter. Great Western—all models. Mikro Bantam, 1SH, 2TH, 3W, 3TH, 4TH Pulverizers; Schutz O'Neill Mills. Baker Perkins Heavy Duty Steam Jacketed, double Arm from 12 to 150 gal. Mixers. (Unidor and Vacuum also) J. H. Day, from 4 up to 75 gal., Imperial and Cincinnatus, D. A. Jacketed, Sigma Blade Mixers. Day & Robison Dry Powder Mixers, 100 up to 10,000 lbs. Package Machy, FA, FA4, Miller Hayssen 3-7 Scandia auto, Wrappers. Hudson Sharp Campbell auto. Cellophane Wrapper.
REBUILT AND GUARANTEED—This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements.
UNION STANDARD EQUIPMENT CO.
318-322 Lafayette St., New York 12, N. Y.

SAVE WITH GUARANTEED REBUILT EQUIPMENT: 2 New R. D. Wood 500 ton EMBOSSING PRESSES: 54"x28" platen: HYDRAULIC PRESSES: 42"x37", 20" ram, 475 tons; 2-7 opening 27"x27", 18" ram, 565 tons; 24"x24" 12" ram, 170 tons; 24"x20" 10" ram, 110 tons; 20"x20" 10" ram, 110 tons; 20"x20" 10" ram, 200 tons; 30"x20" 8" ram, 75 tons; 24"x20" 8" ram, 75 tons; 14"x14" 8" ram, 75 tons; 15"x15" 8" ram, 75 tons; 2-19"x24" 10" rams, 75 tons; 12"x12" 6½" ram, 50 tons; 14"x14" 8" ram, 50 tons; 8"x 9½" 4½" ram, 20 tons; 16"x16" 3½" rams, 12 tons; PREFORM PRESS: Colton 5½T, Reeves Drive and Motor; LABORATORY PRESSES: Carver & Watson Stillman Units; NEW UNIVERSAL DUAL PUMPING UNITS: 3-15 HP; NEW LABORATORY MILLS, and CALENDERS; EXTRUDER; Modern Plastic 1½"; ACCUMULATOR; HPM 6" ram 2500#, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO. INC., 285 Hudson Street, New York 13, N. Y.

WE HANDLE HYDRAULIC PRESSES, pumps and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. HYDRAULIC SAL-PRESS, INC., 386-90 Warren Street, Brooklyn 2, N. Y. MAin 4-7847.

HYDRAULIC PRESSES rebuilt, repaired. Used presses from laboratory to 1000 tons standard and special, molding and hobbing presses, etc. Used pumping units up to 10,000 p.s.i. all capacities. CLIFTON HYDRAULIC PRESS CO., 291 Alwood Rd. P.O. Box 325, Clifton, New Jersey.

FOR SALE: POLYVINYL ACETATE UNIT, capacity 1000# per hour. Includes, 500 gal. s/s Reaction Kettle with Condensers and Xpl motor; 6' dia. x 15' long s/s, d.h. Rotary Resin Dryer; solid bowl type, all s/s Centrifuge, 30" x 40", m.d.; 3—s/s Tanks, 500 gal., 250 gal.; 3—s/s Pumps with Xpl motors. Equipment is NEW, entirely of 316 stainless. Priced at fraction of new cost. Drawings available. CONSOLIDATED PRODUCTS CO. INC., Observer Highway, Cor. Bloomfield Street, Hoboken, N.J. HOboken 3-4425. N.Y. Tel: BArclay 7-0600.

STOKES ROTARY PELLET PRESSES (5): 16-punch RD-3 and 15-punch RDS-3. (2) Kux model 25 Presses 21 and 25 punch. Ball & Jewell #1½ stainless steel rotary cutter. Mikro Pulverizers #1-SH, #1-SI, #2-TH, #2-SI & 24". Large stock steel and stainless tanks and kettles. PERRY EQUIPMENT CORP., 1429 N. 6th St., Philadelphia 22, Pa.

FOR SALE: 5 Carver 5-pot hydraulic Presses with Pumps. Pressure 6,000 PSI. In first class operating condition. Now set up in plant in Chicago. Must be moved immediately. Available at sacrifice prices for quick sale. Reply Box 1422, Modern Plastics.

FOR SALE: Pratt Whitney Keller Machine—Model D.C.—Good condition—CHICAGO DIE MOLD, 4001 Wrightwood Avenue, Chicago 39, Ill. See or call Miss Matthews.

FOR SALE: 1—6 ounce Horizontal Watson-Stillman Injection Molding machine complete with instruments. In good condition and can be seen in operation—$3300.00. BACHMANN BROS., INC., 1400 E. Erie Avenue, Phila., Pa.

FOR SALE: 1 Lester 12 oz. injection molding machine, new in 1946. 1 Paterson 8' dia. conical blender, 5000#, MD. 3 Stokes 100 & 150 ton compression molding presses. 1 10"x20" 2 roll plastics mill. MD. CHEMICAL & PROCESS MACHINERY CORP., 146-148 Grand Street, NYC 13, Tel.: WO 4-8136.

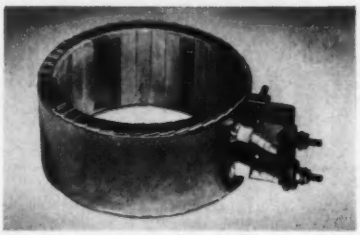
FOR SALE: Drum Machine for cutting table cloths, shower curtains, etc.—motorized—expands from 36" to 112"—equipped complete—$595.00 Used rolls 60 to 72" base. Chill Rolls, heating rolls, Rubber covered Plain rolls, idlers, and Baloney bars. Tensionless tubing machine to give you variations hard or soft rolls. T & M MACHINE & TOOL CO., 29 Greenpoint Avenue, Brooklyn 22, N. Y. Tel.: EVergreen 9-1964.

(*Continued on page 248*)

Leading Injection
& Extrusion Machinery
Manufacturers Use . . .

"INDUSTRIAL"

CERAMIC-INSULATED BAND HEATERS*



This high-efficiency heater is installed as original equipment by many of the best-known makers of plastics machinery to assure . . .

- super-fast morning warm up
- higher operating temperatures
- increased output

We can supply this heater in models that are custom tailored to your present machines.

*commonly referred to as "ceramic heaters"

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1921-1954

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Temperature Indication

You Benefit from *Eye-Level Readings*

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Model F-1 temperature indicator
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Rigid stem or capillary tubing for EYE-LEVEL remote reading. Priced from $22.
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INSTRUMENT AND GAUGE DIVISION
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TEMPERATURE INDICATORS & RECORDERS

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CHANCES

BUT WHY? WHEN RELIABLE
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Our Technical Staff Will Gladly
Assist You In The Proper Selection

OHIO-APEX DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
NITRO, WEST VIRGINIA

CLASSIFIED ADVERTISING

(Continued from page 246)

MACHINERY and EQUIPMENT WANTED

WANTED: Plant or Machinery including Rubber Mills, Hydraulic presses, Sturdy mixers, Calenders, Banbury mixers, Pulverizers, Grinders, Rotary cutters, Extruders, Screens, Injection Molding machines, Dryers. CONSOLIDATED PRODUCTS CO. INC., Observer Highway, Cor. Bloomfield Street, Hoboken, N.J. HOboken 3-4425. N. Y. Tel: BArclay 7-0600.

WANTED: Large Plastic Laminating Type Press, over 250 tons. Pump or cylinder condition not important. Will consider press and small space rental in vicinity of New York. Reply Box 1430, Modern Plastics.

WANTED: Banbury Mixers, Heavy Duty mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider an operating or shut down plant. P. O. Box 1351, Church Street, New York 8, N.Y.

MATERIALS FOR SALE

VIRGIN & SCRAP POLYETHYLENE—Continuous Supplies. AMERICAN VINYL CORP., 73-30 Grand Ave., Maspeth, L. I., N. Y.

POLYETHYLENE OFFERED — NATURAL VIRGIN CRYSTALS. Manufacturers original packing and put up. DYNH 3 (Bakelite) or ALATHON 10 (Du Pont) Prompt shipment from holding Warehouse inventory. Prices commensurate with market at all times. THE CLEMENTS COMPANY, 125 S. Front Street, Phila. 6, Pa. Tel: MArket 7-7122.

FOR SALE: PVA SHEET—659 pounds, Reynolon #4301 in 10 inch wide rolls in original packages. Also 800 pounds Strux (cellular cellulose acetate) ¾" x 6" x 15 feet. Both priced to sell. Write LONE STAR BOAT MANUFACTURING COMPANY, P.O. Box 698, Grand Prairie, Texas.

POLYSTYRENE, ACETATE, PERSPEX, NYLON, BUTYRATE, and all Thermo-Plastic Scrap sorted in our own Works. Regular supplies available from stock. Also virgin and reground Powders. WANDEX PLASTICS, 23 Pitfield Street, N. 1., London, England.

MATERIALS WANTED

MOLDERS-EXTRUDERS-FABRICATORS
SELL US YOUR SCRAP
Liquidate Your Surplus Inventory—OR—
List It With Us For Quick Sale.
CLAUDE P. BAMBERGER, INC.
152 Centre Street Brooklyn 31, N. Y.
Tel.: Main 5-5553
Not Connected With Any Other Firm

WANTED: PLASTIC SCRAP IN ANY FORM. Rejects—Nozzle Waste—Surplus Inventories, Obsolete Virgin Molding Powders—Acetate, Butyrate, Ethyl Cellulose, HI Impact, Nylon, Polyethylene, Polystyrene, Vinyl, Acrylic. Highest Prices Paid. We also reclaim your scrap. Consult us for Reprocessing Charges. GERING PRODUCTS, INC., 7th St., Kenilworth, N.J. Cranford 6-2900.

WE ARE ALWAYS IN THE MARKET FOR THERMOPLASTIC SCRAP AND REJECTS OF ALL KINDS. Also surplus or obsolete lots of reprocessed and virgin materials purchased. Highest prices paid. Custom grinding and compounding to your specifications. PLASTIC MATERIALS, INC., 589 Main Street, Westbury, L.I., N.Y. DIAL—WEstbury 7-7124.

WANTED: PLASTIC SCRAP OR REJECTS in any form. Also surplus and obsolete lots of virgin molding powders. We also custom reprocess your own scrap. A. BAMBERGER CORP., 703 Bedford Ave., Brooklyn 6, N. Y. Telephone: MAin 5-7450.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate. Custom grinding, magnetizing, compounding, and straining of contaminated plastics. FRANKLIN JEFFREY CORPORATION, 2004 McDonald Avenue, Brooklyn, N. Y., ES 5-7943.

MOLDS FOR SALE

PLASTIC INJECTION MOLDS FOR SALE. 3 molds for boxes originally made to hold safety razor & blades. Hinge type or Telescope type, size 4"x2"x¾". Reply Box 1420, Modern Plastics.

MOLDS WANTED

WILL BUY OR RENT
Established Canadian manufacturer and custom molder, enlarging capacity of injection plant in January, will buy, rent, or rent on a royalty basis, molds for toys, housewares, packages and other items which lend themselves to promotion by our livewire national sales organization. Send particulars and samples. Will also assist companies to establish permanent Canadian facilities. Reply Box 1417, Modern Plastics.

BRUSH MOLDS & BRUSH MACHINERY, injection molds for ladies, men's, military, nail, toothbrushes, etc. Send particulars & samples. Box 382, REALSERVICE, 110 West 34th St., New York, N. Y.

SOUTH AMERICAN MOLDER Wants to Buy Mold for Plastic Water Tumbler. Offer with samples and mold description. As well interested buying molds of novelty's etc. Reply Box 1404, Modern Plastics.

HELP WANTED

VINYL CHEMISTS. Expanding organization with plants in Chicago and Boston areas has openings for qualified, technical men with compounding background in Vinyl Dispersions and other industrial surface coatings. Chief Chemist, salary to $10,000. Development Chemist, salary commensurate with experience. Include Resume. Reply Box 1403, Modern Plastics.

MANUFACTURER'S REPRESENTATIVE
We want capable manufacturer's representatives in Chicago and certain other territories to sell custom injection molded parts. We have an unusual arrangement to offer.
Write—ARENS CONTROLS, INC.
2017 Greenleaf Street, Evanston, Illinois

POLYESTER PRODUCTION MAN:—If you have experience in the fabrication of Polyester resins we can offer a partnership and/or a profit sharing arrangement in a new large scale operation without any investment by you. To qualify, a thorough know how of all phases of production with current experience in the actual fabrication and production of corrugated sheets, auto bodies, etc., is required. A technical background is preferred but not essential. We will also consider a technical service man who is engaged in development work in the manufacture and use of polyester resins. Write giving details which will be held in the strictest confidence to the JOHN BROKERAGE ASSOCIATES CO., Rooms 303-306, 400 38th Street, Union City, New Jersey.

DESIGNER-MODEL MAKER Large plastic toy manufacturer, metropolitan New York, requires services of industrial designer and model maker familiar with injection molding and allied fields. Reply Box 1427, Modern Plastics.

SUBSTANTIAL COMPANY presently engaged in extrusion wants diversification and expansion through new products and techniques. Have need of sound man to direct compounding, cost reduction, and development of new items. Should be familiar with existing extrusion compounds, raw materials and extrusion techniques. Would consider polyethylene film and sheeting experience desirable, along with treating, printing, sealing, vacuum forming of extruded sheets, welding, and other fabrication techniques helpful. Salary commensurate with ability and experience. Give full experience in first letter. Reply Box 1429, Modern Plastics.

NEW PRODUCT CHEMIST OR ENGINEER, EASTERN AREA
Large eastern chemical company has opportunity for technical man, with experience, in development of new Chemical Specialties products for fields not served by existing products.
Originality and demonstrated accomplishment important considerations. Write giving age, experience, education, salary expected and photo, if possible. Replies held strictly confidential. Reply Box 1426, Modern Plastics.

SALESMAN—Injection Molder located in Boston desires representative for custom molding to cover New York State, New Jersey, Pennsylvania. Has designing, modelling and toolroom staff. Experienced only. State education, background. Reply Box 1408, Modern Plastics.

CHIEF ENGINEER—Large plastic toy manufacturer, metropolitan New York, has excellent opportunity for engineer thoroughly familiar with engineering, design and production of plastic items from design stage to final assembly. Engineering degree required. Send complete resume. Reply Box 1428, Modern Plastics.

PLASTIC SUPERINTENDENT. We want a top man experienced in all phases of Injection Molding—assume full charge of foreman, production, quality control etc. Supervise machine maintenance. Must be good organizer and leader and capable of getting the best results from his assistants. Unusual opportunity with large established Chicago Molder. Reply in confidence to Company President. Salary open plus profit sharing. Reply Box 1401, Modern Plastics.

ENGINEER DRAFTSMAN—Boston Injection Molding Company requires engineer with some experience in preparing mold and parts drawings. Must also have knowledge of manufacturing processes. Excellent opportunity for right young man. State age, education, experience. Reply Box 1409, Modern Plastics.

(Continued on page 250)

Here are examples of the wide variety of Sylvania-molded parts available.

QUALITY— MOLDED PARTS

IN ANY DESIGN... ANY MATERIAL!

Sylvania's modern plastic plant offers a wide range of facilities for molding and finishing both thermosetting and thermoplastic materials. Fully automatic and semi-automatic injection and compression type molding presses, supplemented by engineering "know-how," enable Sylvania to produce your product economically . . . to your complete satisfaction.

Our plastic engineering staff is at your service for the development or improvement of products for use outside, as well as within, the electronics and lighting industries.

Give Sylvania the opportunity to quote your molded plastic parts requirements. A line on your letterhead will bring you further information you desire. Write to Sylvania, Dept. 4A-2402, at the address shown below.

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In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine St., Montreal, P. Q.

CLASSIFIED ADVERTISING

(Continued from page 248)

INJECTION MOLDING PLANT SUPERVISOR—N.Y.C.
Complete knowledge Reed-Prentice machine. Good technical background. Capable of taking complete charge of personnel, production and quality control. Write stating qualifications.
Reply Box 1416, Modern Plastics

POLYETHYLENE PIPE Extrusion Engineer with proven production experience, capable of initiating and assuming full responsibility for polyethylene pipe production in new division of established Eastern extrusion company. Send resume giving complete history, salary requirement, etc. Reply Box 1407, Modern Plastics.

Large Michigan proprietary injection molder expanding facilities needs (1) INJECTION MOLDING FOREMAN—nite shift. (1) SETUP AND MACHINE MAINTENANCE MAN—day shift. (1) MOLD-MAKER—take charge mold repairs. Excellent opportunity for experienced men to join progressive company. Pleasant community; year round employment; many benefits. Moving expenses paid. State experience and salary expected. BOX MP 581, 221 W. 41 St., New York 36, N. Y.

SALES ENGINEERS to represent old-established injection molder. Press capacity 4 to 200 ounces. Tool room, painting, silk screening, hot stamping—all conveyorized. Straightline assembly. Automatic packaging equipment. Prefer experienced men and men with industrial contacts. Also men controlling one or more special deals. Large midwest plant. Give complete details. Personal interview to follow. Reply Box 1400, Modern Plastics.

EXTRUSION PRODUCTION SUPERVISOR Growing north of Boston extrusion company desires really experienced extrusion man familiar with all phases of vinyl and polyethylene extrusion, cross sections and pipe. Liberal salary and profit sharing. Must be experienced. Submit complete resume, qualifications, experience and references. Also salary desired. All information will be held strictly confidential. Reply Box 1425, Modern Plastics.

RESIN SALES. Could use one more good man. Full line Urea, Phenolic Resins—Liquid or Powder types. All correspondence treated in confidence. Address Reply to SALES MGR., c/o P.O. Box 1768, Wilmington, Delaware.

POLYESTER RESIN PRODUCTION MAN. Capable of equipping and producing glass laminated corrugated polyester resin sheets in a new small plant venture. Thorough knowledge of all phases production essential. Technical background preferred but not essential. Excellent offer to right party. Preferred location of plant in Western Pa. Write giving complete background and details. State present salary. Reply Box 1421, Modern Plastics.

SITUATIONS WANTED

CASTING ENGINEER and equipped pilot plant, if desired. Broad experience and knowledge in casting methods, applications and formulations of the Epoxy, Polyester, Allyl, Phenolic and Polyvinyl Chloride resins in conjunction with the manufacturing of mechanical and electro-mechanical parts, casting intricate shapes of all sizes, and the encapsulation, potting or hermetic sealing of electronic components. Reply Box 1406, Modern Plastics.

CHEMIST: B. S. Thirteen years diversified and successful experience in resins, plastics, adhesives, coatings, paper, impregnation technics, materials of construction, oil filters. Desire responsible, challenging position. Name your product—will develop or improve it. Age 36. Family. California location preferred, but will consider other areas. Reply Box 1413, Modern Plastics.

PLASTICS SALES ENGINEER, selling molded and fabricated plastic parts and components to manufacturing industries for past three years. Chemical Engineer, age 31, married, will travel or relocate for position offering good future. Broad experience covers injection and compression molding, also custom sheet fabrication. Reply Box 1418, Modern Plastics.

COATING, LAMINATING, EXTRUSION, Impregnation, Gravure Printing, Foil Rolling, Vacuum Metal Evaporation. Rubbers, plastics, thermosets and latex. Aluminum, papers, films and textiles. Defense and commercial. Extreme temperatures. At present chemical director AaA-1 multi-plant company which operates in all these fields. Wish to change; available for two days per week on permanent basis. Development, Production or Marketing. Individual problem, or general supervision or special conditions. Reply Box 1410, Modern Plastics.

GENERAL MANAGER of well known injection molding plant desires relocation for personal reasons. Has 15 years experience with well known manufacturers. Complete knowledge of piece part and mold design, estimating, manufacturing, cost analysis, and machinery. Has complete experience as sales engineer with necessary contacts. Well known and with best references throughout entire plastic industry. Will relocate. Reply Box 1412, Modern Plastics.

PLASTICS TECHNOLOGIST, diversified background in lacquer and dispersion coatings, plastisols, emulsion polymerization, thermosetting molding powders and laminating varnishes. Ph.D. with excellent record of accomplishment in laboratory research and development. Desires a challenging position with a reputable Company. Would consider technical service. Reply Box 1424, Modern Plastics.

CHEMIST: thoroughly experienced in administration, production, research and development of vinyl custom coatings, printing, embossing and laminating; extrusion of polyethylene film and coatings. Desires responsible and diversified position in custom thermoplastic extrusion. New England area preferred. Reply Box 1411, Modern Plastics.

SALES AGENTS WANTED

REPRESENTATIVES WANTED by manufacturer of high impact compression molding compounds. Many good territories open. Write Box 1414, Modern Plastics.

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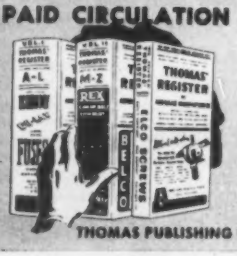

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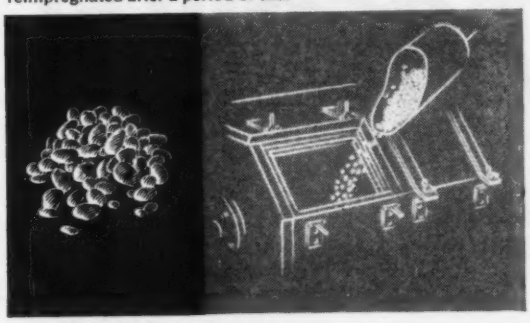

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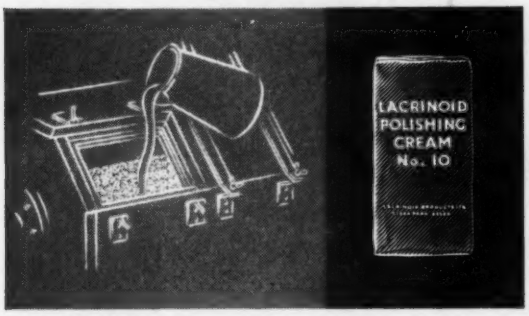

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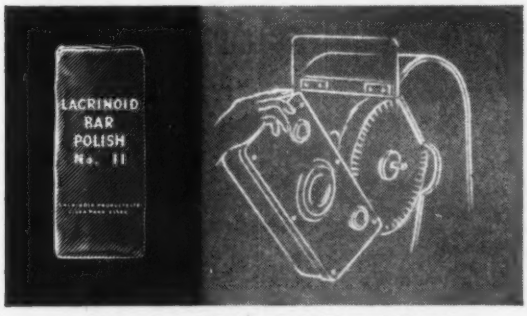

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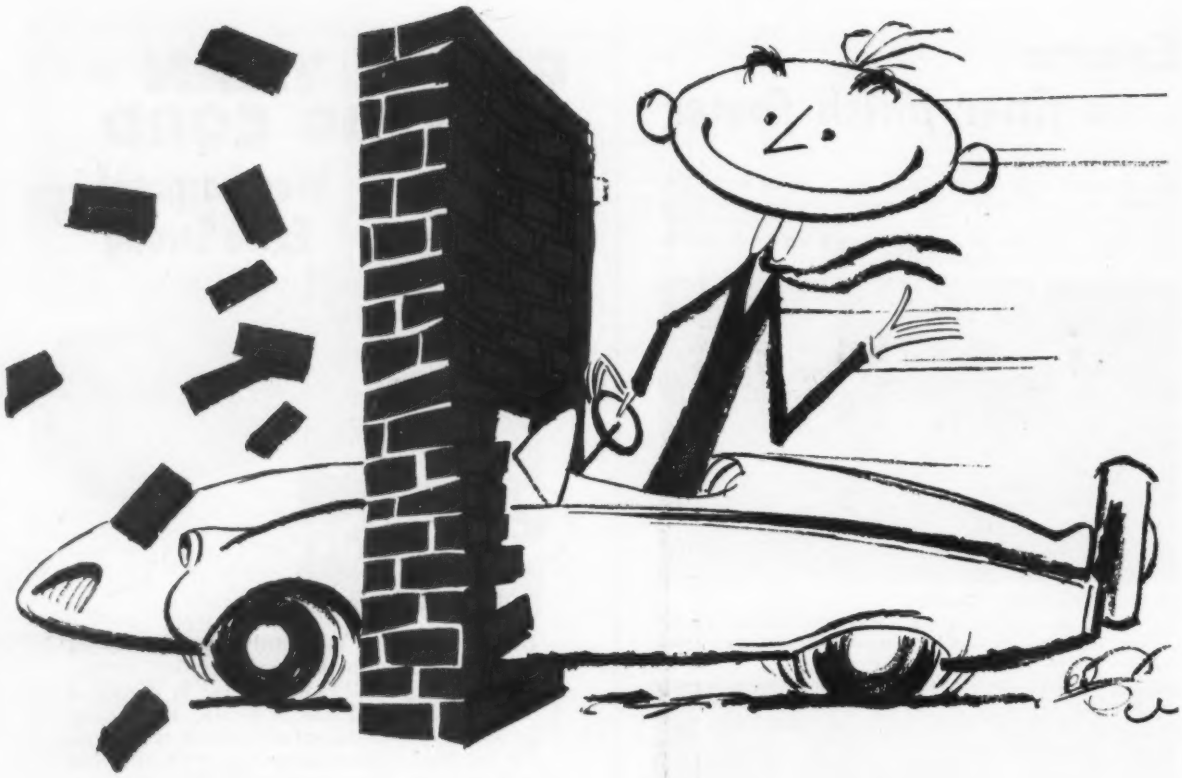

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Kalite®—Size about 1 micron, coated with 1% stearic acid.

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*Performance Comparison** of PX-114 and DOP

Property	PX-114	DOP
Tensile Strength (psi)	2900	3100
100% Elastic Modulus (psi)	1500	1600
Shore Hardness (10 sec)	78	78
Low Temp. Flexibility Tf (°C)	—25	—26
Activated Carbon Volatility (24 hrs. @ 90°C.)	9.2%	5.0%

*Note: Formulation
Vinyl Resin 65%
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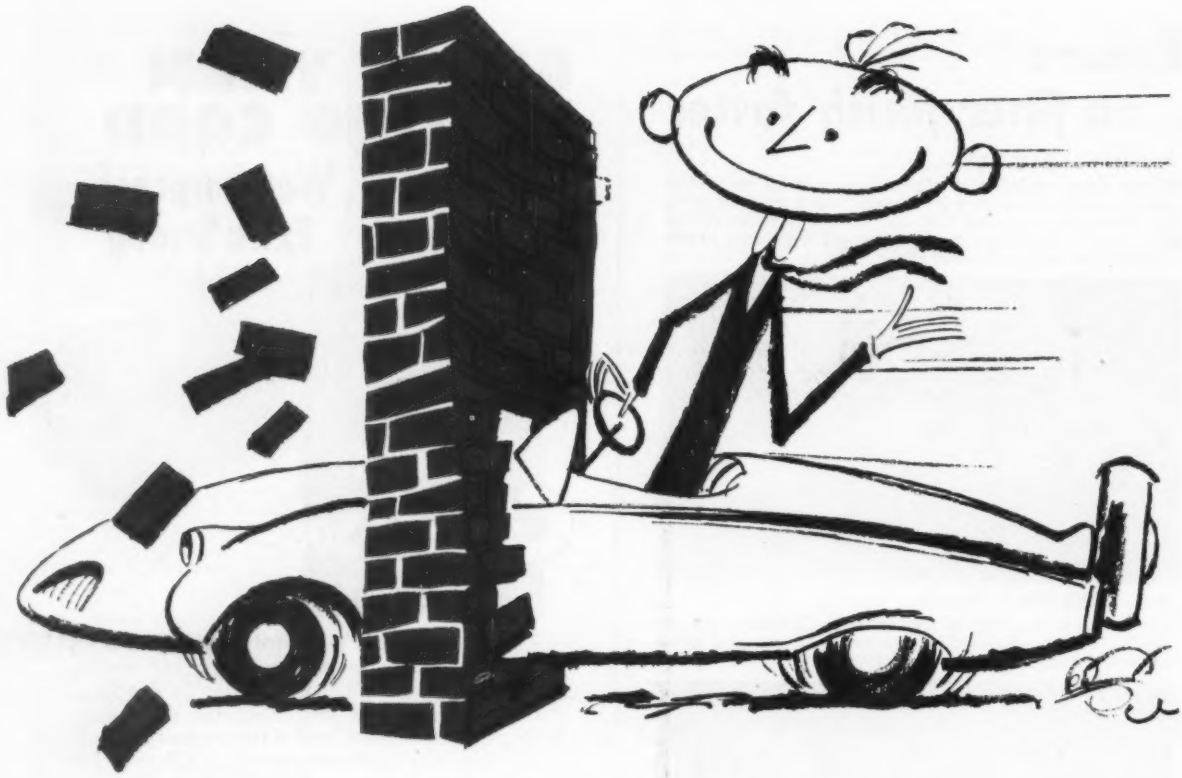

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Ba-Cd Stabilizer 3 phr

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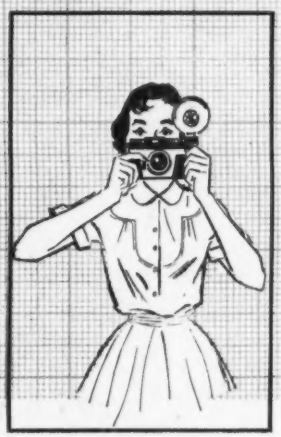
ENGINEERED IN PLASTICS BY GENERAL ELECTRIC

How can General Electric

MOLD SALES APPEAL INTO YOUR PRODUCT...



CUT YOUR PRODUCTION COSTS?

Interested in making your product click with the customer . . . cutting production costs at the same time? Here's a case that shows how General Electric plastics engineering can help.

The Argus Company—makers of the famous Argus C-3 and 75 cameras—wanted the same maximum sales appeal molded into their new Argus A-4.

G-E plastics engineers worked closely with Argus as on the other two cameras. Their wide experience with plastics materials enabled them to suggest the *right* plastics—one which would help Argus get *the most attractive appearance* for its light and compact A-4 . . . yet retain *maximum strength.*

Furthermore, General Electric engineers suggested the alteration of certain contours and the redesigning of some parts. Argus benefited by lower mold costs . . . closer tolerances for faster assembly . . . and a higher molding rate that reduced unit cost.

General Electric has long been recognized in the trade for its ability to handle the "tough" jobs. This ability, along with expert mold making and extensive press facilities, is why so many manufacturers come—and *come back* —to G. E. for plastics parts.

For your next molding job, why not see G. E.? Just write to General Electric Company, Section **450-1A,** Chemical Division, Pittsfield, Massachusetts.

You can put your confidence in—

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